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States and Federal Environmental Policy: A Hierarchical Linear Model of CAA And CWA Implementation

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While designed and adopted at the federal level, the Clean Air Act (CAA) and Clean Water Act (CWA) rely on states for implementation. The result of this implementation framework is a disparity in environmental conditions across the nation. The objective of this research is to examine how the implementation stage of the policy process affects program outcomes. The findings indicate that the primary means of shaping program outcomes are the decision-making criterion and subsequent behavior of implementing officials, where their value based actions dictate service delivery. These decisions are, in turn, shaped by the context of the work, where organizations and the socio-political environment influence the basis for decision-making. These findings connect broader organizational and socio-political factors with program outcomes through an indirect relationship, rather than assume a direct relationship as previous authors have done. The findings explain a significant portion of the variance in both air and water program outcomes across the nation.

This research indicates the importance of front-line operators in the implementation process, an issue that has been left-out of other work. These conclusions can be used to enhance performance management by practitioners, through a greater understanding of how organizations and individuals affect program outcomes. Finally, the theoretical framework and methodological techniques suggest that previous implementation research has failed to properly specify statistical models, which enhances the literature on the subject.

DEDICATION

I want to dedicate this dissertation to my grandfather, Fred Fowler, who has always pushed me to pursue my education.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

The continued health and sustainability of the environment remains one of the most important challenges of the American government, society, and industry in the 21st century. New advancements in technology and science have the potential to lessen the environmental impact of the modern life. Ecological Modernization theory contends not only can new technology reduce the environment impact of existing economic processes, but can produce economic benefits through the more efficient use of natural resources (Mol, 2003; Mol, Sonnenfeld, and Spaargaren, 2009). However, governmental action to support and encourage environmental protection is vital to the success of efforts for a sustainable environment. Though major environmental legislation dates back to the late 1940's, the most significant strides in environmental protection by the federal government find their origins in the late 1960's and early 1970's as part of the emerging environmental movement in America (Speth, 2004). With the National Environmental Policy Act of 1969 (NEPA), the federal government has maintained a comprehensive policy towards promoting environmental enhancement and protection (EPA "Summary of NEPA"). Nevertheless, as a string of literature indicates, policy outcomes hinge on efficient and effective implementation (Pressman and Wildavsky, 1973).

Technological advancements, scientific achievement, and societal concern mean little if they cannot be capitalized on to create benefits for society as a whole. For the environment, the government must adapt policy to best utilize and encourage the vast technological achievement the United States has prided itself on for generations. While there is a balance between environmental concerns and economic development, the two are not mutually exclusive (Mol, 2003; Mol, Sonnenfeld, and Spaargaren, 2009). Furthermore, as quality of life measures become increasingly important, environmental conditions can create a competitive advantage for jurisdictions that make serious efforts to maintain quality in air, water, and land (Kincaid, 2006). If properly implemented, environmental policy can create a healthier, more sustainable environment for the American people as well as all mankind. For policies to be successful, they must be properly implemented and administered, especially by state agencies which have a substantial role in federal environmental policy implementation.

The federalist organization of the United States creates an environment in which implementation and administration of both specific policies and management of wide policy areas are coordinated across levels of government and include activities by federal, state, and local governments. The balance of power between the state and federal government has evolved over time, but now is defined as New Federalism in which the states have much discretion in implementation, administration, and policymaking within broad federal guidelines (Nathan, 1996). In environmental policy, the federal government, specifically the Environmental Protection Agency (EPA), relies heavily on states to "adopt implementation plans designed to attain the standards…" set by Congress for "permissible levels of common pollutants and deadlines for meeting them" (Derthick, 1987, p. 67). The scheme for environmental protection in the United States relies heavily on the role of states to achieve goals set at the federal level (Ringquist, 1993).

The implementation of public policy has clearly been identified as a unique stage of the policy process. Implementation is the realization of public policy, when it moves beyond discussion in legislative bodies and into application to the real world. Since the first edition of the seminal work by Pressman and Wildavsky (1973), policy scholars have taken notice of the significant potential of the implementation process to affect public policy. Dye (2011) asserts policy implementation as an essential step of the process alongside identification, formulation, legitimization, and evaluation. Several other sources establish alternative frameworks of the process, but implementation remains a central concept (Jones, 1977; Anderson, 1979; Kraft and Furlong, 2007; Birkland, 2011). As with the other stages of the policy process, implementation carries the potential to dramatically affect policy outcomes, and is ripe for analysis. In the aftermath of the publication of Pressman and Wildavsky (1973), frameworks for analysis of the policy implementation process began to develop indicating the deviations which can emerge due to internal and external administrative factors (Van Meter and Van Horn, 1975; Sabatier and Mazmanian, 1980). Implementation is a significant responsibility of administrative agencies, especially for state environmental agencies under federal environmental legislation such as the Clean Air Act (CAA) and Clean Water Act (CWA). Thus, implementation carries significant potential to explain differences in environmental conditions between states.

State environmental protection efforts have developed in a variety of structures. EPA lists 81 state agencies with responsibility for at least some component of environment management within their respective jurisdictions. Of the 50 states, 26 concentrate environmental protection in a single organization, 18 in two organizations, five in three organizations, and one in six organizations. These organizations include a wide variety of missions. These agencies can be categorized based on the purpose, which includes environmental quality and protection, natural resources and conservation, health, multi-purposes, or niche purposes (EPA "State Environmental Agencies"). The variation in organization schemes is reflective of the variation of approaches to environmental management by state agencies.

With origins in the classical period, the Departmentalism school formed as a complement to Scientific Management. Whereas the concern of Scientific Management was on finding the "one best way" of performing a task, Departmentalism concentrated on the formal institutional structure of organizations. The legendary Luther Gulick and his cohorts focused on the organizational chart as the level of analysis, contending a well-structured organization was the key to efficient and effective administration. However, interest in this approach faded as it had with scientific management (Fry and Raadschelders, 2008). Nevertheless, the 2000s saw a reemergence of some of the underlying assumptions with the growth of research on organizational structure (Fry and Raadschelders, 2008). Wilson (1989) introduced a watershed outlook, positing organizational structure matters, by focusing on outcomes and outputs as the distinction between approaches to bureaucratic action. As the structure of organizations is a reflection of social values (Frederickson and Smith, 2003), structure can and does vary widely, even within the same policy area, as the federal system allows for states to design their own institutions driven by their own cultures (Fitzgerald and Hero, 1988). Structure and organization shape decision-making, implementation, and outcomes (Frederickson and Smith, 2003). Thus, as organization varies, policy outcomes are likely to vary as well.

The context, whether it is geographic, political, or economic, is equally as important in understanding the responses to environmental issues (Emison and Morris, 2010). There has been a long and distinguished line of literature which take a state politics approach to explaining the differences in environmental outcomes, efforts, and policymaking of the states (Konisky and Woods, 2011). As the context of state environmental efforts differs, so do the responses to environmental issues (Ringquist, 1993b; Emison and Morrison, 2010). Thus, the impact of these differences in state environmental agencies is vitally important to understanding environmental management efforts and the implementation of federal environmental policy.

This research explores the relationship between implementation decision-making, organizational characteristics, and socio-political factors in the policy implementation process and environmental outcomes. As the majority of implementation of environmental policy occurs at the state level, the study focuses on state environmental protection agencies. As the primary implementing agencies of environmental policy, the differing process structures effecting implementation in those agencies carry significant potential to influence environmental policy outcomes, and in turn environmental conditions. Thus, the analysis of implementation factors and their context in state agencies provides new insight into environmental management efforts in a federal system.

For the analysis, a hierarchical linear model (HLM) will be used. The analysis results in findings concerning multi-level relationships between predictors and policy outcomes in the implementation process. The use of environmental indicators in policy research is by no means new, and has been effectively used by numerous scholars and government agencies (Hammond, et al, 1995). According to Ringquist (1993):

> "only air and water quality regulations contain relatively unambiguous, measurable policy goals that can be quantitatively evaluated. We can measure progress in air pollution control by examining changes in pollutant emissions and airborne concentrations of pollutants. In water pollution control, we can also examine the concentration of certain benchmark pollutants" (p. 11-12).

Alternatively, there are no benchmarks of criteria pollutants nor widespread monitoring associated with environmental issues such as waste dumps or pesticide (Ringqust, 1993). The states play an overwhelmingly important role in the implementation of air and water regulations under the CAA and CWA. Thus, dependent variables indicate the quality of air and water within state jurisdictions as it relates to human health and environmental sustainability.

The independent variables include a range of factors that account for the differential decision-making within and contexts of state environmental agencies. The independent variables account for the differences between state environmental agencies and the explanatory power of overall state environmental health. At Level-1 of the model are the decision-making criteria of front-line operators; at Level-2, the contextual factors shaping the decision-making. In general, the differential achievement of environmental protection by state agencies is assessed by decision-making of implementers and the context in which implementation and administration of environmental policy occurs. The identification of independent variables was theoretically driven based on existing research (in Chapters 3, 4, and 5). Variables were designed to look into implementation decision-making, organizational processes and structures of agencies, and the socio-economic and political context of states to determine how these agencies are approaching their responsibilities and conducting their work. The independent variables control for much of the variation between state environmental protection administration agencies.

As environmental management strategies do not have immediate results, an adequate cross-sectional representation that includes a time component of the causal relationship between predictors and policy performance is necessary. Thus, the analysis includes a component of time to account for potential policy learning. Data was gained principally from two sources: publicly available documents and information, and surveys. Data concerning social, political, economic, and environmental factors was derived from readily available and accessible public documents. Data concerning factors that are indicative of specific administrative agencies was gained from surveys. The online surveys asked questions designed to account for agency specific factors related to the agency organization and policy implementation from employees of state environmental agencies. The surveys were necessary to provide the information about individual agencies that are not readily available in extant datasets.

This chapter develops first with a problem definition, highlighting the issues surrounding environmental policy implementation at the state level. Next, an introduction of New Federalism and the balance of power between state and federal government in the aftermath of the Devolution Revolution and a discussion focused on the role of states in implementing federal environmental policy will be presented. Finally, a brief introduction to the CAA and the CWA will be outlined, as well as the responsibility of the state and federal governments in their implementation and oversight.

Finally, the chapter concludes with a summary of the purpose of the study and the organization dissertation.

Problem Definition

The CAA and CWA establish national standards for air and water quality. While EPA is the federal agency responsible for environmental policy, the design of the CAA and the CWA have resulted in the implementation and day-to-day administration of these programs falling to state environmental agencies (EPA "History of CAA"; EPA "History of CWA"). In the era of New Federalism, states have taken on a growing responsibility in the federal system for the administration of programs adopted at the national level. The envisioned goal of the CAA and CWA was national standards of air and water quality. However, there are no set norms for implementation plans of CAA and CWA programs, although plans must be approved by EPA. The result is a variation in the implementation strategies and approaches taken by these agencies. As a corollary, state environmental agencies have developed in a range of structures, further accenting differences between the administrative capacities of state agencies (Ringquist, 1993).

Environmental quality is far from uniform across the nation, with citizens in some states encountering near pristine conditions and the citizens of others being exposed to potentially harmful levels of environmental pollutants (Environmental Defense Fund, 1999). The implementation of the CAA and CWA has experienced success across the nation, but this success has been unevenly distributed between states. Ringquist (1993) asserts "with states taking over a significant amount of responsibility for environmental programs, as well as numerous other policy areas, an important question arises over the ability and competence of the states to administer these programs" (p. 63). The variations in air and water pollution control programs, and by extension air and water quality, the policy area is an excellent specimen for comparative state administration analysis (Ringquist, 1993). Quality in air and water hinges on the effective implementation of the provisions of the CAA and CWA. Effective implementation, in turn, is significantly impacted by organizational factors and implementer decision-making in the organization responsible, in this case state environmental agencies. Thus, environmental quality is likely to be drastically effected by the organizational factors and implementer decision-making in state environmental agencies.

Federalism and Environmental Policy

Federalism is easily defined as the relationship between the federal, state, and local governments. However, "the relative strength of the role of these middle-level governments is what determines the overall strength of federal systems" (Nathan, 1996). Thus, in America, the role of state governments is the key to federalism. Federalism, in the original era, was amply defined as Dual Federalism, or layer cake federalism, in which the state and national governments developed independent spheres of influence. While environmental policy was few and far between during this era, regulation and management of natural resources fell to the state governments, with the federal government dedicated to broader issues (Lowi, 2006). The courts have played umpire between the state and national governments, with court rulings helping to define the distinctions in function between levels of government (Smith, Greenblatt, and Buntin, 2005). The courts facilitated the concept of dual sovereignty and separation of functions with rulings by the Marshall Court in McCulloch v. Maryland (1819) and Gibbons v. Ogden (1824), respectively. This approach to federalism continued as late as 1918 with Hammer v. Dagenhunt, which found only states could regulate child labor. As the nation developed, the conflicts between state and national governments began to emerge, as the national government found increasing need to venture into policy areas traditionally reserved for state governments (Lowi, 2006).

With the New Deal, a new era of federalism emerged. It became apparent that responding to the intense troubles of the Great Depression could not be handled with a separation of functions between levels of government. The New Deal programs called for a new type of federalism termed Cooperative Federalism, or marble cake federalism, in which all three levels of government were to work together in managing programs to achieve mutually desirable ends (Smith, Greenblatt, and Buntin, 2005). Nevertheless, there were early problems in the movement towards this new model of federalism as the court struck down New Deal programs as an overextension of national authority. Not one to accept defeat, President Franklin D. Roosevelt proposed an expansion of the Supreme Court from nine Justices to 15, allowing Roosevelt to stack the court with new Justices favorable to his programs (Lowi, 2006). In response, Justice Roberts reversed his position from previous cases in West Coast Hotel Co. v. Parrish (1937) as a political move to prevent FDR from pursuing his court packing plan; this move has since been deemed the 'switch in time that saved nine' (Leuchtenburg, 1995; Cushman, 1998).

In response, the courts produced rulings in the National Labor Relations Board v. Jones & Laughlin Steel Corporation (1937), Helvering v. Davis (1937), and Steward Machine Company v. Davis (1937) switching the precedent for New Deal Programs. The rulings found New Deal legislation constitutional, expanded national authority under the general welfare clause to anything serving the common good, and allowed for broad Congressional power to influence state laws, respectively (Lowi, 2006). For nearly five decades, all levels of government worked in contingency to manage policy; however, the system was wholly dominated by the federal government in both policymaking and administrative oversight, with state and local governments serving as nothing more than extensions (Peterson, 1995; Nathan, 1996; Smith, Greenblatt, and Buntin, 2005; Lowi, 2006).

It was during the era of cooperative federalism that the federal government began to pioneer environmental policy in the United States. During the late 1940's and early 1950's, Congress passed the first national legislation for the protection of air, water, and land, with the Air Pollution Control Act of 1955 (EPA "History of CAA"), Water Pollution Control Act of 1948 (EPA "History of CWA"), and Federal Insecticide, Fungicide, and Rodenticide Act of 1947 (EPA "Federal Insecticide, Fungicide, and Rodenticide Act), respectively. These early acts were designed to provide funding and technical assistance to state and local governments for the management of national policy goals (Belden, 2001; Copeland, 2003). As the nation saw tremendous economic development in the post-war era, the need to amend existing and adopt new environmental legislation became apparent. However, with the evolution of environmental policy came a change in state-federal relations.

Cooperative Federalism served as the predominant model of intergovernmental relationships until challenges to the status quo were launched by the President Richard Nixon (Peterson, 1995). The Nixon Administration began to use block grants for broad policy areas rather than the use of more narrow categorical grants. Nixon's reforms, especially in the area of welfare, were not long lived, however (Nathan, 1996). New Federalism did not overtake cooperative federalism until the reforms of President Ronald Reagan. Reagan made broad proposals for the devolution of power from the federal government to the state governments with the states taking on more responsibility and discretion in both policymaking and administration (Peterson, 1995; Nathan, 1996). The quiet revolution altering the power relationship between state and federal governments was termed the Devolution Revolution. Gaining control of both Houses of Congress in 1994 for the first time in nearly four decades, Congressional Republicans, led by Speaker Newt Gingrich, continued the Reagan era move towards devolving with reforms to welfare and social policy (Nathan, 1996).

The courts mirrored these changes with the first rulings to limit Congressional power under the commerce clause in New York v. U.S. (1992), U.S. v. Lopez (1995), and U.S. v. Morrison (1997). New Federalism has served as the predominant model of state-federal relations in recent years (Smith, Greenblatt, and Buntin, 2005). States have been slowly gaining more responsibility over programs and discretion in administration and policymaking. However, these reforms have come at a cost as states now carry a heavier burden than ever before. More control over programs has resulted in less financial support from the federal government, with unfunded mandates remaining as a major issue facing states (Van Horn, 2006). Additionally, federal agencies and the courts have stepped-in with increased oversight of state administration to ensure states are fulfilling their obligations under sweeping national laws such as the Social Security Act of 1965 (Van Horn, 1996).

As new federal environmental legislation was adopted alongside the movement for devolution, more and more discretion and responsibility was given to state governments for implementation and administration. As clean water legislation was expanded in 1972, 1977, and 1987, and clean air legislation was expanded in 1963, 1970, 1977, and 1990, the role of state governments went from simply receiving technical assistance and funding while following the lead of federal policymakers to being fully responsible for the implementation of the CAA and CWA. In the current form, state environmental agencies carry the responsibility for the implementation, administration, and oversight of the provisions of the CAA and CWA, while EPA's role is to oversee state activities (Lester, 1994; Belden, 2001; Copeland, 2003; Breaux et al, 2010). The evolution of federalism in the latter half of the 20th century has carried heavy implications for the implementation and administration of environmental policy.

In New State Ice Co. v. Liebmann (1932), Justice Louis Brandeis wrote "a single courageous State may, if its citizens choose, serve as a laboratory; and try novel social and economic experiments without risk to the rest of the country." In that opinion, Brandies coined the phrase "laboratories of democracy" in referring to the ability of states to create innovation in policy and administration (New State Ice Co. v. Liebmann, 1932). Traditionally, this has referred simply to the policy-making tasks of state government. However, the implementation process can offer opportunities for innovation or stagnation. Within the implementation process, administrative discretion exists allowing decisions to be made that can have an impact on the procedures of implementation, and in turn can dramatically alter the policy. The variations in state social, political, and cultural contexts have drastic impacts on their processes and institutions as well as their policies and innovations (Fitzgerald and Hero, 1988; Mead 2004; Emison and Morrison, 2010). According to the GAO:

> "this model of state enforcement of environmental laws, accompanied by EPA's regional oversight, allows the level of government closest to environmental conditions to assume primary responsibility for implementing programs. The relationship between EPA and state environmental agencies varies substantially from state to state and program to program" (GAO, 2007).

States have proven themselves as the keystones of the federal system (Bowling and Wright 1998). States have approached many problems with an eagerness that manifests into innovation in policymaking and administration in a quest to achieve national preeminence, as states have been highly dynamic when allowed adequate discretion. The public has a higher degree of trust and confidence in the public services and regulations administered by state governments than those by the national government (Mundy, 2007; Rabe, 2010). Moreover, when states fail, the blame is placed primarily on their federal partner further perpetuating the perception of the necessity of states in the federal system (Rabe, 2010). In the environmental arena, states issue more than 90% of all environmental permits, complete more than 90% of all environmental enforcement actions, collect 95% of the data used by the federal government (Rabe, 2010), and 96% of environmental programs have been delegated to the states (Environmental Council of the States, 2011). The ability of states to utilize discretion in approaching public problems has empowered them to find tremendous success in policy and administration, but also led to inconsistencies in programs and outcomes as not all states are responding to policy needs effectively (Lowry, 1996).

There has been no systematic evidence of a race to the bottom in environmental management efforts for the states. Kincaid (2006) argues it is "unlikely even with further devolution, because environmental interest groups have clout in most states and because environmental protection is increasingly an economic asset for many states" (p. 65 – 66). Additionally, there is a greater value on quality-of-life indicators in the developing service economy, further placing emphasis on the need for environmental quality in states as a competitive advantage (Kincaid, 2006). Rabe (2010) contends the goal of achieving national preeminence has led to a "race to the top" in environmental protection. Claiming states as the "new heroes" of environmental policy, Rabe (2010) argues broad public support for environmental protection providing the impetus for bottom-up policymaking, a sizable base of talent and ideas from a growing class of environmental policy professionals and organizations, and direct democracy initiatives have spurred states to take on a more innovative role in environmental management. The devolution of power over environmental protection has likely improved state level environmental protection services, through increased discretion.

The National Environmental Protection Act of 1970 saw a great disparity across states due to implementation by state agencies, who became more concerned with procedural compliance than policy success (Wichelmann, 1976, p. 263). State governments have extensive freedom in organizing their environment protection apparatus allowing for wide discrepancies in the approach, interest, and prioritization in environmental issues. In 1999, the Environmental Defense Fund determined Texas, Oklahoma, Montana, and Wyoming performed the worst in their analysis, while New Jersey, California, Washington, and Ohio performed the best, indicating a wide variability in the condition of the environment across states (Environmental Defense Fund, 1999). State action has become an indispensible part of the success or failure of environmental policy. Thus, environmental policy is subject to a broad variety of internal and external factors across states shaping policy efficiency and effectiveness.

As numerous scholars contend, states are an integral part of environment management in the United States. In 1981, Idaho decided:

> "not to fund the state's air quality program, forcing EPA to administer it. Both state and federal officials concluded after a year that the federal takeover caused more problems than it solved. EPA reportedly spent almost five times as much to maintain the Idaho program that year as the state would have spent to do the same job" (Derthick, 1987, p. 70).

Lester (1995) through an assessment of environmental policy theory indicates that states are becoming an increasingly important part of environmental management in the United States, due to the federalist framework in which states and the federal government are sharing responsibility for cross-jurisdictional problems. Furthermore, Ringquist (1993) contends the 1970s were the beginning of state control of environmental policy "but always under careful federal supervision… state responsibilities in pollution control have been expanded since the mid-1970's, and the importance of the states in environmental policy…" has not waned since (Ringquist, 1993, pp. 44 – 63). However, Hayes, Esler, and Hayes (1996) suggest the commitment to the environment is varied across the country. Bacot and Dawes (1997) find there is explanatory power in both fiscal commitment and dedicated effort for environmental program success across states. On the other hand, Potoski and Woods (2002) argue state environmental decisions are a result of diverse problems experienced by each state. Alternatively, Emison and Morris (2010) find the Southern states are notably unique in their approaches to environmental policy implementation and management, as they are caught between innovation and tradition. Despite the development of research in this area, Lester and Lombard (1990) argue there is a dearth of literature “about the conditions that promote or inhibit state environmental management;” an argument which retains validity two decades later (p. 301).

Even with this new found independence, states are also heavily dependent on the federal government for essential funding, as well as research and development. As environmental problems tend to not respect state lines, the EPA has become indispensible in coordinating multi-state and regional efforts (Rabe, 2010). In 2004, the EPA in partnership with Environmental Council of the States developed State Review Frameworks (SRF) to assess the performance of state enforcement of environmental regulations under the CAA, CWA, and federal hazardous waste laws (EPA “State Review Frameworks). According to the Government Accountability Office (GAO), through the use of the SRF and National Environmental Partnership System (NEPPS), EPA has created a greater cooperation between the state and federal governments in the implementation of environmental regulations. Partnership in these programs began with six in the pilot project in 1996. Currently, all 50 states are participating in the program for the CAA, and 44 states in the program for the CWA. The improved oversight has led to a more consistent approach to overseeing the programs, and identified several weaknesses in how states enforce environmental laws (GAO, 2007). The SRF approach has provided an element to understanding the outcomes of implementation plans, which the states would not have access without the cooperative relationship with EPA.

The Clean Air Act

The CAA "sets forth a complex and intricate mechanism for regulating sources of air pollution, and has spawned more than 9,500 pages of regulations in the Code of Federal Regulations" (Belden, 2001, p. 1). The current provisions of the CAA have evolved over six decades to manage air quality. The first federal legislation regarding air pollution was the Air Pollution Control Act of 1955; however, the Clean Air Act of 1963 was the first legislation to address air pollution control. These acts were followed by the Air Quality Act of 1967, which served to expand federal programs in air pollution control (EPA "History of CAA"). The CAA of 1970 marked a major shifted in federal policy towards air pollution. The CAA of 1970 created the National Ambient Air Quality Standards (NAAQS), State Implementation Plans (SIPs), New Source Performance Standards (NSPS), and the National Emission Standards for Hazardous Air Pollutants (NESHAPs). Most notably, the NAAQS set the standards for air quality and the SIPs establish plans for implementing these standards. As part of the CAA amendments, the EPA was directed to develop regulatory guidance for the states in establishing implementation plans for the NAAQS (Belden, 2001, p. 7).

As a result of "lack of overall progress in achieving the ambitious goals" of the 1970 amendments to the CAA, further amendments were adopted in 1977 (Belden, 2001, p. 7). The 1977 amendments extended provisions for NAAQS to prevent deterioration of conditions within those areas attaining standards, and to establish new requirements for areas not meeting those standards. In 1990, a major overhaul to existing programs and the addition of new programs was adopted. The 1990 amendments created new programs for acid rain, ozone depletion, toxic air pollution, and emissions from mobile sources, as well as establishing a national permits program for stationary sources of pollution. Additionally, provisions for the attainment and maintenance of NAAQS were significantly expanded. (EPA, "History of CAA").

Under the CAA, each state has the primary responsibility for assuring air quality within its jurisdiction meets national standards (EPA "On-line State Implementation Plan Manual"). States are required to develop SIPs to attain and maintain NAAQS (EPA "State Implementation Plan Overview"). According to Beldin (2001):

> "A SIP is a collection of EPA-approved control strategies and regulations which may include state statutes, rules, transportation control measures, emission inventories, and local ordinances that are designed to prevent air quality deterioration for areas that are in attainment with the NAAQS or to reduce criteria pollutants emitted in nonattainment areas to levels that will achieve compliance with the NAAQS" (p. 23).

The two main purposes of a SIP are to demonstrate a state has an air quality management program capable of implementing the NAAQS and identify the state emission control requirements (EPA "State Implementation Plan Overview"). A SIP must include: enforceable emission limitations; a program for enforcement of emission limitations; monitoring, compiling, and analyzing data; adequate funding, staffing, and legal authority; air quality monitoring and periodic reports; and consultation with local political subdivisions (Belden, 2001). Once a plan has been submitted to and been approved by the Administrator of the EPA, an implementation plan carries the force of federal law (Buche, 1985). It has taken several years in most cases for states to develop an EPA-approvable implementation plan (Belden, 2001). Within the frame of the CAA, SIPs provide states with significant discretion in administering provisions. In essence, states are asked to achieve goals by appropriate means, with EPA overseeing those efforts.

The provisions of the CAA have improved and are likely to continue to improve both public health and environmental quality (Hubbell, et al, 2010). David Driesen, Associate Professor at Syracuse University College of Law, began his 2002 testimony before the House Committee on Energy and Commerce by asserting "I'm pleased to report that the 1990 Amendments have improved public health and ameliorated environmental impacts. We have reduced emissions of most of the pollutants the Amendments target, often quite substantially." Since 1970, air regulations stemming from the CAA and its subsequent amendments have reduced emissions of the six principal criteria pollutants over the same period that U.S. gross domestic product rose by over 200% (EPA, 2008). In 2011, the third evaluation report of the CAA by the EPA estimated that reductions in fine particle and ozone pollution as a result of the CAA amendments of 1990 have prevented 160,000 cases of premature mortality, 130,000 heart attacks, 13 million lost work days, and 1.7 million asthmas attacks (EPA, 2011). In 2008, a report from the Office of Management and Budget (OMB) estimated annual program costs at between $26 billion and $29 billion, with annual benefits between $70 billion and $573 billion (OMB, 2009). The 2011 EPA report estimates the annual economic benefits of the CAA amendments will reach nearly $2 trillion by 2020, with annual implementation costs only $65 billion (EPA, 2011).

Relying heavily upon state regulation, the partnership between the states and EPA has "made significant progress in protecting public health and the environment" (Driesen, 2011). However, as air quality standards have become more stringent many states have experienced problems with maintaining compliance (Edwards, 2004). Progress in many states, nevertheless, has not met the success envisioned in the adoption of the 1990 Amendments (Driesen, 2011). While states have seen success in implementation, "compliance with certain standards has proven to be considerably challenging to particular states and areas with higher concentrations of certain pollutants" (Edwards, 2004, p. 1). The CAA has proven successful overall, but the results remain uneven across the states due to the reliance on state implementation which has proven inconsistent.

The Clean Water Act

The CWA is "the principal law governing pollution of the nation's surface waters" (Copeland, 2003, p. 1). The first effort at federal regulation of water pollution was the Federal Water Pollution Control Act of 1948, which primarily provided assistance to state and local governments to address water pollution problems (EPA "History of CWA"). From 1956 to 1972, several laws were passed to expand federal authority over water quality regulation. However, the perception of regulations as time-consuming and ineffective, slow clean-up efforts, and increased public interest in environmental issues lead to pressure for a major overhaul of water quality control efforts (Copeland, 2003). Amendments in 1972 continued some of the basic aspects of existing law, as well as "set optimistic and ambitious goals" for the future (Copeland, 2003, p. 3). The 1972 amendments were a crucial turning point in water quality standards, taking on a new strength and legitimacy.

The 1972 amendments are the most significant for the establishment of the framework for water pollution control. Additionally, the 1972 amendments introduced the common name of the Clean Water Act to the federal regulatory provisions (EPA "Summary of CWA"). The 1972 amendments established the basic structure for pollutant discharge regulation including permitting for point source pollution into navigable waters, establishing the EPA's regulatory authority over water quality standards in surface and waste waters, and planning for nonpoint source pollution control (Copeland, 2003). The current water quality control scheme is focused on point source pollution of navigable waters. Point sources are "discrete conveyances such as pipes or man-made ditches," which directly pollutant navigable waters. Point sources such as industrial or municipal (such as municipal sewage systems) must be permitted to release pollutants (EPA "Summary of CWA"). Plans to control non-point sources are developed at the state level to address the needs of the individual states, but overseen by EPA (Copeland, 2003). In 1987, the most recent amendments were made, which began the State Water Pollution Control Revolving Fund as a funding mechanisms for water quality projects through EPA-state partnerships. Better known as the Clean Water State Revolving Fund, the fund was a replacement for the previous grant system (EPA "History of CWA").

The CWA "is an experiment in cooperative federalism," in which EPA and the states are required to work together for the implementation of the provisions for water quality (p. 63). According to Houck (2002), "Congress plainly intended for states to implement the program and for EPA to backstop it only where the states failed to do their jobs" (p. 59). Under the CWA program responsibilities fall to EPA for administration, but state and local governments are the principals for day-to-day oversight, implementation, and management of the programs (Copeland, 2003). The EPA has allotted the responsibility for permit issuance for point source pollutions to 45 states, making them the primary arm of implementation and oversight for point source pollution (EPA "State Review Frameworks"). In this capacity, states have become the primary authority for the management of water quality under the CWA. The 1987 amendments placed further responsibility on the states to manage water quality, with new program administration being steered to the states rather than EPA. The 1987 amendments extended programs to require states to develop and implement plans relative to nonpoint source pollution. As part of the extensions, states are required to develop "total maximum daily loads" (TMDLs) which set a limit to the pollutants exposed to a given body of water without violating water quality standards (Copeland, 2003). The EPA maintains statutory accountability for many of the provisions of the CWA, but in the aftermath of the Devolution Revolution many of the administrative responsibilities have been handed over to state agencies.

Since the 1972 adoption of the CWA, there has been significant progress in water quality in the United States (Andreen, 2004). According to EPA, "the evidence is overwhelming that the regulatory and policy design of the CWA has achieved significant successes in many waterways" (EPA, 2000). Evaluating competing measures of water quality, Adler, Landmark, and Cameron (1993) contend there has been "considerable progress in reducing the total amounts of pollution reaching U.S. surface waters from specific sources" (p. 17). Rivers and lakes in urban and industrialized areas exposed to point source discharges have experienced the greatest improvements (Andreen, 2004).

The provisions for point source discharges from municipal and industrial wastewater treatment plants have been particularly successful, as well (Sanudo-Wilhelmy and Gill, 1999). Additionally, there has been significant progress made in the number of new water treatment systems and the pounds of pollutants removed from the system, which is one of the traditional measures used to judge success of water quality regulation (Adler, Landmark, and Cameron, 1993).

However, data from the National Stream Quality Accounting Network (NASQAN) managed by the United States Geological Survey (USGS) show no significant trends in either direction for water quality from 1978 to 1987 (Adler, Landmark, and Cameron, 1993). Moreover, there remain some shortcomings in implementation, progress, and results for the CWA; critics have not been fully satisfied with the results (Adler, Landmark, and Cameron, 1993; Andreen, 2004). Nevertheless, Adler, Landmark, and Cameron (1993) contends "all this information, taken together, confirms that progress has been made in reducing the release of some pollutants by some sources" (p. 22). While the progress has been uneven, the reductions that have been produced have improved water quality overall in some waters. No data has indicated any type of widespread trend reflecting deterioration in U.S. water quality (Adler, Landmark, and Cameron, 1993). Thus, at the very least, the CWA has managed to stabilize water quality in many waterways. The CWA has found noteworthy success, but it has proven to be unequal across the country.

Purpose of the Study

The objective of this research is to determine the relationship between implementation and context of state environmental agencies and air and water quality. The CAA and CWA establish national standards for air and water quality; however, decades after the most recent amendments to both acts, there remain disparities in environmental conditions across the United States. The implementation of these policies is ripe for analysis, as the implementation stage of the policy process has a significant impact on policy outcomes. State environmental agencies have adopted a range of implementation approaches and organizational structures, as well as operate in a variety of political, economic, and social contexts. As state environmental agencies are responsible for the implementation of the major provisions and regulations of both acts, analysis of these state agencies can provide a better understanding of the success of federal environmental policy. The purpose of this research is to determine how and why environmental protection efforts have had such a varied experience from state to state, with an analytical lens focused on policy implementation. For the purposes of this study, three primary research questions have been formulated.

1. How does the implementation process employed by state environmental agencies effect environmental outcomes under the CAA and CWA?
2. How do implementation decisions by front-line operators affect outcomes?
3. How are those implementation decisions framed by the context of decision-making?

As the implementation process and organization structure are two distinct elements of environmental agency organizational factors, they each suggest their own set of independent variables. These questions will be answers utilizing a hierarchical linear model (HLM) with variables representing factors relative to either the implementation process or organizational structure. A casual relationship with state level air and water quality will be determined based on the analysis

Organization of Dissertation

The first chapter presented a discussion of the significant role state agencies play in environmental policy implementation within the federal system. These agencies have adopted different structures features and processes resulting in variability in the implementation process. This variability carries the potential to explain differences in the environmental outcomes relative to two major federal environmental programs principally administered by state governments: the Clean Air Act (CAA) and the Clean Water Act (CWA). Additionally, this chapter has presented an introduction to the issues relative to the analysis including policy implementation, agency variability, and research design and analysis.

The second chapter presents an overview of the CAA and CWA, as well as a discussion of measuring the effectiveness of environmental policy. As the major pieces of legislation in air and water pollution, a background of the history of air and water regulation legislation and the current provisions of the CAA and CWA present a necessary background component for the study. Additionally, measuring the effectiveness of the CAA and CWA presents a particular problem for policy researchers and warrants a review of the literature as a background to the analysis.

The third chapter presents a literature review of state politics research into environmental policy outcomes. As the dominant strain of literature in research of state-level environmental policy, a review of the existing findings of the political effects on environmental policy outcomes both provides a background into state environmental policy research and will form the basis for a theory of the effects of state politics on environmental policy outcomes.

The fourth chapter presents a literature review of structural approaches to organizational theory. From the beginnings with Departmentalism to the reemergence of Public Institutional approaches, organizational structure has long been a staple of analysis for organizational theorists. A review of the literature to indicate applicable structural factors will form the basis for a theory of the effects of organization on environmental policy outcomes.

The fifth chapter presents a literature review on public policy implementation. Over the decades, scholars have begun to recognize the significance of the implementation step in the policy process, and have become more sophisticated in its analysis. A review of the literature to determine how the implementation process affects policy outcomes will form the basis for a theory of the effects of implementation on environmental policy outcomes.

The sixth chapter describes the theoretical framework. The theoretical framework seeks to combine many approaches into a single model. With a systems theory/principal agency frame, concepts from top-down and bottom-up models, as well as from broader policy process models such as Sabatier's Advocacy Coalition Framework and Ostrom's coproduction concept, were integrated to produce a cyclical model of implementation.

The seventh chapter describes the research design and methodology. The chapter outlines the choice and measurement of independent and dependent variables, the model specifications, and the data collection methods and the analytical approach. Additionally, the chapter provides the background for HLM, as well as notable concerns affecting this research.

The eighth chapter presents the results of the analyses, with a highlight of the factors most influential in effecting environmental outcomes. The findings provide support for the theoretical framework, and the use of the multi-level model in testing the implementation model.

Finally, the ninth chapter will present a discussion of the findings and conclusions based on the analysis. The conclusions are noteworthy due to the implications for environmental management, implementation modeling, and the connecting theory and practice in public administration and policy.

CHAPTER 2

SEARCHING FOR CLEAN AIR AND WATER

The intent of this chapter is to provide a background to the Clean Air Act (CAA) and the Clean Water Act (CWA). The chapter will be presented in three parts. The first and second parts will be an overview of the CAA and CWA with regards to the history, legislative provisions, and implementation mechanisms, respectively. The CAA and CWA contain numerous provisions aimed at progressing air and water quality, which are notable in understanding the implementation roles and obligations of the states. Finally, the third part will present a discussion of measuring the effectiveness of environmental quality under the CAA and CWA as a means of policy evaluation. Measuring outcomes in environmental policy has proven to be a difficult endeavor, and warrants a discussion of the issues for assessing the effectiveness of the CAA and CWA, as well as providing a foundation for the analysis in later chapters.

The Clean Air Act

The CAA "sets forth a complex and intricate mechanism for regulating sources of air pollution, and has spawned more than 9,500 pages of regulations in the Code of Federal Regulations" (Belden, 2001, p. 1). The modern CAA finds its origins in the 1950's but has experienced a significant evolution since. It is currently one of the most complicated environmental statutes in the United States (Belden, 2001). The initial move towards regulating air quality was undertaken by the Eisenhower administration in 1955 with the Air Pollution Control Act. The foundation of the CAA, however, was adopted in 1963. The CAA saw major amendments in 1970, 1977, and 1990. The framework of the CAA was most effectively established with the 1970 amendments. Additionally, the 1990 amendments represent the most significant overhaul of this framework (EPA "History of the CAA"). Each new piece of air quality legislation represents a major expansion of the regulatory authority of the federal government. The CAA and the major amendments are summarized in Table 2.1 (EPA "History of CAA").

Table 2.1.

Summary of Clean Air Act and Major Amendments

Act	Summary
Air Pollution Control Act of 1955	• First federal air pollution legislation • Funded air pollution research
Clean Air Act of 1963	• Development of national program for air pollution • Extended research and grant programs
Air Quality Act of 1967	• Programs for interstate air pollution • Expanded research activities
Clean Air Act of 1970	• Established NAAQS, SIPs, NSPS, and NESHAPs • Increased enforcement
1977 Amendments to the CAA of 1970	• Refocused goals from CAA of 1970 • New provisions for non-attainment areas
1990 Amendments to the CAA of 1970	• New expanded provisions for acid rain, ozone depletion, toxic air pollution, emissions from mobile sources, and permit programs • Major revisions to NAAQS

Source: EPA, "History of the CAA," http://epa.gov/oar/caa/caa_history.html.

The current provisions of the CAA have been evolved over six decades to manage air quality. The first major tragic experience with air quality in the United States was in Donora, Pennsylvania in 1948 when a cloud of smog resulted in nearly two dozen deaths and thousands of illnesses (Davis, 2002). An incident of smog related deaths in London in 1952 was another catalyst for a new consideration of the impact of air pollution on human health (Davis, 2002). The result of this new interest in air quality was the Air Pollution Control Act of 1955 which provided research money and technical assistance through the U.S. Surgeon General for state implementation of controls. The provisions of the 1955 legislation were scant and did not address the sources of pollution or standards for air quality. Federal legislation was expanded in 1963 in response to reports of several hundred deaths as a result of "killer smog" in London and New York (Belden, 2001). The Clean Air Act of 1963 was the first dedicated to air pollution control, and the first to use "Clean Air Act" as a title (EPA "History of CAA"). The 1963 legislation marked the beginning of what is considered to be the CAA. The act added more research and grant programs under the direction of the Department of Housing, Education, and Welfare (HEW) to reduce interstate air pollution (Belden, 2001). However, it still fell short of major provisions for the regulation of air quality.

These acts were followed by the Air Quality Act of 1967, which served to expand federal programs in air pollution control (EPA "History of CAA"). It was the first foray of the federal government into regulation of air pollution sources. The Air Quality Act required states to "establish ambient air quality standards based on the federal criteria for air quality control regions designed by" HEW (Belden, 2001, p. 6). Prior to the establishment of the Environmental Protection Agency (EPA) in December 1970, air pollution programs fell under HEW. The main goals were to promote public health and welfare, expand research into air pollution control, provide assistance to states in implementation, and develop regional air pollution programs. However, it suffered from "a lack of effective enforcement provisions" (Belden, 2001, p. 6). The most notable contribution, though, is the establishment of the initial framework for federal-state partnership in air pollution control that has served as a keystone of subsequent legislation (Belden, 2001). As a result, air pollution control in the United States has been managed through a collaboration of state and federal efforts, with states taking on much of the responsibility for the implementation and the federal government establishing regulatory standards.

The year 1970 was a landmark time in environmental policy in the United States with the founding of the EPA, the adoption of the National Environmental Policy Act of 1970 (NEPA), and new amendments to the CAA. Though legislation for the regulation of clean air existed before 1970, increased public attention on air pollution spurred further efforts for environmental regulation (Repetto, 2006). The Clean Air Act (CAA) of 1970 marked a major shift in federal policy towards air pollution. The CAA of 1970 created the National Ambient Air Quality Standards (NAAQS), State Implementation Plans (SIPs), New Source Performance Standards (NSPS), and the National Emission Standards for Hazardous Air Pollutants (NESHAPs) (Belden, 2001). Most notably, the NAAQS set the national standards for air quality for the protection of human health and welfare, and the SIPs directed the states in implementing these standards. The provisions would represent the first standards for air pollutants. As part of the CAA amendments, the EPA was directed to develop regulatory guidance for the states in establishing implementation plans for the NAAQS (Martineau and Novello, 2004). Under the federal-state partnership developed by the CAA, responsibility for implementation of air pollution control plans fell to the states. In the case that states failed to gain of the approval of EPA for their SIP, "the agency was given the authority to impose a federal implementation plan containing source-specific standards" (Belden, 2001, p. 7).

As a result of "lack of overall progress in achieving the ambitious goals" of the 1970 amendments to the CAA, further amendments were adopted in 1977 (Belden, 2001, p. 7). The 1977 amendments extended provisions for NAAQS to prevent deterioration of conditions within those areas attaining standards, and to establish new requirements for areas not meeting those standards (EPA "Summary of the CAA"). While there were several major changes to standards, the core of the federal-state partnerships remained intact. At the time of adoption, many areas of the country had failed to meet the standards and were making little progress towards those standards. The 1977 amendments were meant to refocus the goals of the 1970 amendments, by expanding the time frame for goal attainment and creating new provisions for non-attainment areas (Belden, 2001).

In 1990, a major overhaul to existing programs and the addition of new programs was adopted. The 1990 amendments built on the existing structure of the 1970 and 1977 amendments, with expansions for emerging problems that were not addressed by the previous legislation (Martineau and Novello, 2004). The 1990 amendments expanded programs for acid rain, ozone depletion, toxic air pollution, and emissions from mobile sources, as well establishing a national permits program for stationary sources of pollution. Additionally, there was a major overhaul of hazardous air pollutant provisions for the attainment and maintenance of NAAQS. (EPA, "History of CAA"). The CAA, developed over six decades, is one of the most comprehensive environmental management programs undertaken in the United States.

The CAA is a complex, multi-program piece of environmental legislation that can hardly be easily summed up. However, in an effort to provide a brief overview of the CAA's provisions, five programs can be focused upon as the core, for the purposes of the study here. These programs, all of which were either established or modified by the 1990 CAA amendments, are the National Ambient Air Quality Standards (NAAQS), State Implementation Plans (SIPs), New Source Performance Standards (NSPS), National Emissions Standards for Hazardous Air Pollutants (NESHAPs), and Title V Operating Permits.

The national basis of air pollutant emissions regulation is formed in the NAAQS, along with additional regulations for new stationary sources of air pollution. Furthermore, the NAAQS provide the basis for the rules related to the SIP and air permit emission limits (Belden, 2001). The NAAQS are national air quality goals for ambient air, all outdoor air external to buildings, for the protection of human health and the public welfare (EPA "NAAQS"). The CAA requires EPA to establish both primary and secondary standards. Primary standards provide for the protection of public health (i.e., protecting sensitive populations from exposure), while secondary standards provide for the protection of public welfare (i.e., damage to vegetation or animals) (EPA, "NAAQS"). Pollutants are identified based on three criteria: 1) substance is an air pollutant; 2) pollutant is emitted by numerous or diverse sources; and 3) the pollutant's presence in the atmosphere may endanger public health or welfare (Belden, 2001). EPA has identified six common air pollutants as criteria pollutants for regulation under the NAAQS due to "scientifically demonstrated effects on health and environment at certain levels" (Belden 2001, p. 12). The six common air pollutants are carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO2), ozone (O3), particle matter (PM), and sulfur dioxide(SO2). The NAAQS for the six criteria pollutants are summed up in Table 2.2 (EPA "NAAQS").

Primary standards are designed to protect public health; secondary standards are focused on environmental impacts. The standards within NAAQS are not specifically enforceable, but are directly linked to rules developed in SIPs (Belden, 2001). EPA develops NAAQS as the ceiling of emission levels of specific pollutants through a careful review of science. Monitoring efforts of NAAQS are geographically bound by air quality control regions (AQCRs), rather than by contemporary jurisdictional boundaries such as states or counties. These AQCRs are designated as being in attainment or in nonattainment. For attainment regions, the regulatory goals are to remain in attainment. For nonattainment regions, states are required to develop a step-by-step process to establish enforceable air quality control regulations to bring the area into attainment. The strategies to either maintain attainment or reduce air pollution to come into attainment are incorporated into the SIPs (Martineau and Novello, 2004).

SIPs, as required by the CAA, are designed for the implementation of emission limitations outlined in the NAAQS and strategies for the control of criteria pollutants in both attainment and nonattainment areas. The state implementation strategy for air quality control measures was first established under the Air Quality Act of 1967, but the SIP framework was put into place by the Clean Air Act of 1970. The 1990 CAA amendments built on this existing framework, but added new provisions for regulating air quality in nonattainment areas (Martineau and Novello, 2004). Belden (2001) defines a SIP as:

"a collection of EPA-approved control strategies and regulations which may include state statures, rules, transportation control measures, emission inventories, and local ordinances that are designed to prevent air quality deterioration for areas that are in attainment with the NAAQS or to reduce criteria pollutants emitted in nonattainment areas to levels that will achieve compliance with the NAAQS" (p. 23).

Table 2.2.

Summary of NAAQS for the Six Criteria Pollutants

Pollutant		**Primary/ Secondary**	**Averaging Time**	**Level**	**Form**
Carbon Monoxide(CO)		Primary	8-hour	9 ppm	Not to be exceeded more than once per year
			1-hour	35 ppm	
Lead (Pb)		Primary and Secondary	Rolling 3 month average	0.15 $\mu g/m^3$	Not to be exceeded
Nitrogen Dioxide (NO_2)		Primary	1-hour	100 ppb	98^{th} percentile averaged over 3 years
		Primary and Secondary	Annual	53 ppb	Annual Mean
Ozone (O_3)		Primary and Secondary	8-hour	0.075 ppm	Annual 4th-highest daily maximum 8-hour concentration, averaged over 3 years
Particle Matter (PM)	PM2.5	Primary and Secondary	Annual	15 $\mu g/m^3$	Annual mean, averaged over 3 years
			24-hour	35 $\mu g/m^3$	98^{th} percentile, averaged over 3 years
	PM10	Primary and Secondary	24-hour	150 $\mu g/m^3$	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide (SO_2)		Primary	1-hour	75 ppb	99^{th} percentile of 1-hour daily maximum concentrations, averaged over 3 years
		Secondary	3-hour	0.5 ppm	Not to be exceeded more than once per year

Source: EPA, "National Ambient Air Quality Standards," http://www.epa.gov/air/criteria.html

The lack of standardization in SIPs has resulted in a historically unwieldy collection of statutes, regulations, and control strategies that are accompanied in part or in full by EPA approval letters. By no means is there a single model or pattern of SIPs (Belden, 2001). However, they must include: enforceable emission limitations; a program for enforcement of emission limitations; monitoring, compiling, and analyzing data; adequate funding, staffing, and legal authority; air quality monitoring and periodic reports; and consultation with local political subdivisions. Regulations that are enforceable, quantifiable, and create accountability are a requirement for approval by EPA (Belden, 2001). As previously discussed, separate strategies for attainment and nonattainment areas must be included to either maintain NAAQS or to bring an area into compliance with additional regulatory provisions, respectively. Once developed by the states, SIPs, in order to carry the force of federal and state law, have to be submitted for review and approved by the Administrator of EPA. However, EPA has the option to deny approval for plans as submitted by the states. In the event a state fails to develop an approvable plan for implementation, then responsibility for the implementation of regulations to comply with the NAAQS falls to the EPA (McCarthy, 2005).

The 1990 CAA amendments, also, included a new component for the management of regional air quality maintenance to be considered within SIPs. As air pollution does not respect jurisdiction boundaries, air quality control is not simply a local problem. In 1990, Congress adopted several new statutory tools to deal with regional air quality, so certain states were not overburdened by the transportation of pollutants from sources outside of their jurisdiction (Martineau and Novello, 2004). First, SIPs must include provisions for the prohibition or regulation of sources that effect NAAQS compliance in other states. Second, states have the power to petition EPA to take direct action when interstate air pollution creates a hindrance to NAAQS attainment (Belden, 2001). Finally, governing bodies of regional planning for the interstate transportation of air pollution were created "to assess whether and to what extent control measures should be included in the SIPs of the states in the region to satisfy [CAA] requirements" (Belden, 2001, p. 37).

Section 111 of the CAA establishes the NSPS for the use of technology in abating air pollution from new, modified, or reconstructed stationary sources (Belden, 2001). The NSPS establish nationwide standards for technology implementation to create a floor of emissions for industry sources. Congress determined that requiring the adoption of technology by new, modified, or reconstructed stationary sources would be more cost-effective than mandating control technology requirements for existing sources. Essentially, existing sources are "grandfathered in" and are not required to adopt the same level of technology as new sources (McCarthy, 2005). The NSPS are meant to create a level of emissions that is obtainable through the use of the "best demonstrated technology" (BDT), while considering the costs of achieving such reductions and other environmental impacts (Belden, 2001). States are required to implement and enforce NSPS, with the EPA delegating authority to the states (Martineau and Novello, 2004). Additionally, states can adopt a more stringent NSPS program than established by EPA, but not a less stringent program (McCarthy, 2005).

Section 112 establishes regulation for hazardous air pollutants (HAPs). The attempts to regulate HAPs prior to 1990 proved to be notably unsuccessful. EPA currently lists 188 HAPs, compared to 8 before the 1990 amendments. EPA holds the responsibility for maintaining and reviewing the list of HAPs, and may alter the substances on the list if there is adequate scientific data to support such changes (Belden, 2001). The 1990 amendments "completely restructured the air toxics programs, with the goal of developing and implementing new technology-based standards for all listed HAP source categories and subcategories" (Belden, 2001, p. 65). The NESHAP, established by the 1990 amendments, is a two phased program. The first phase is based on the adoption of maximum achievable control technology (MACT) on HAP-emitting equipment. This standard is for both existing and new sources based on the maximum degree of reduction achievable while considering costs and other environmental impacts, similar to the NSPS provisions. The second phase was to develop a residual-risk standard designed to further reduce HAP emissions that still pose a risk to human health, after compliance with MACT is achieved (Martineau and Novello, 2004). The goal of the program was to require stationary sources to adopt technology and plans to reduce emissions, while making considerations for economic hardships related to doing so. Additionally, Section 112 includes a general duty clause for owners and operators of stationary sources which deal with substances that may prove hazardous in which they must identify hazards and develop techniques to mitigate damages in the event of an accidental release (Belden, 2001).

The 1990 amendments to the CAA established an operating permit program under Title V. Prior to the creation of this operating permit program, stationary sources of emissions were only required to obtain preconstruction permits. As a result, the enforcement of provisions of the CAA was difficult for many existing stationary sources (Belden, 2001). With the 1990 amendments, Congress required every emissions source falling under the provisions of the CAA to obtain a permit to operate. In creating the operating permits, "Congress envisioned that a Title V operating permit would bring together all applicable federally required and/or federally approved air emission limitations, work practice standards, monitoring recordkeeping, and reporting requirements for a facility into one document" (Beldin, 2001, p. 94). Consequently, the permit program has eased enforcement and compliance efforts for EPA, state agencies, and sources, as well as public participation and oversight by citizen groups in the regulatory process. Title V specifically directs the states to implement and administer the operating permit program within their jurisdiction based on the minimum requirements established by EPA (Knauss, Broome, and Ward, 1993). Currently, EPA has approved permitting programs for all states. EPA is required to develop guidelines for operating permit programs to be adopted by the states, in an effort to create some standardization among programs and ensure states faithfully implement programs. However, a state may go beyond these minimum requirements and develop specific standards for their jurisdictions (Martineau and Novello, 2004). Additionally, the permitting programs are required to impose fees of at least $25 per ton of each regulated pollutant, though states have discretion on setting the exact level. Permitting fees were designed as both an incentive for states to establish permit programs and to make programs self sustainable through local revenue (Belden, 2001).

The CAA is one of the most famous, or infamous, pieces of environmental legislation in the United States. The CAA consists of many parts, but the most notable for the purposes of this study are the NAAQS for ambient air standards and the SIPs governing implementation by states. The federal-state framework for implementation has existed for over four decades, with the federal government setting standards and the states implementing. Regulating clean air has proven to be one of the most difficult undertakings in environmental policy, resulting in the CAA becoming one of the most complicated and intricate pieces of legislation on the books.

The Clean Water Act

The Clean Water Act (CWA) is "the principal law governing pollution of the nation's surface waters" (Copeland, 2003, p. 1). While the first effort at water quality management was made in 1948, major revisions have been adopted since, which collectively form the history of the CWA. The Water Quality Act in 1965 was the first move towards setting water quality standards. The entire water protection scheme was totally revised with the 1972 amendments to the Federal Water Pollution Control Act of 1948. Amendments in 1977, 1981, and 1987 fine tuned many portions of the law by revising certain provisions and adding new programs (Copeland, 2003; Copeland, 2010). The CWA and the major amendments are summarized in Table 2.3 (Copeland, 2003).

The "first comprehensive statement of federal interest in clean water programs" was presented as the Federal Water Pollution Control Act of 1948 (FWPC) (Copeland, 2003, p. 2). The 1948 legislation formed the basis of the CWA and was the first major law to address water pollution (EPA "Summary of CWA"). Primarily, the Federal Water Pollution Control Act provided assistance to state and local governments to address water pollution problems, as water pollution was viewed as a chiefly state and local program (Copeland, 2003; Copeland, 2010).

Table 2.3.

Summary of Clean Water Act and Major Amendments

Act	Summary
Federal Water Pollution Control Act of 1948	First federal water quality legislation Forms the basis of the CWA
Water Quality Act of 1965	Requires states to set standards in interstate waters for pollution and control requirements
1972 Amendments to Federal Water Pollution Control Act of 1948	Set new standards and goals Required treatment of municipal and industrial wastewater, and provide federal funding for treatment plants Expanded federal role, but maintained state day-to-day responsibilities Established framework of CWA Established permitting for point source pollution in navigable waters Established EPA's authority over water quality in surface and wastewaters Planning for nonpoint sources
Clean Water Act of 1977	Introduced the name: "Clean Water Act" Expanded regulations and EPA authority Provided additional funding for wastewater treatment plant construction
Municipal Wastewater Treatment Construction Grants Amendments of 1981	Improvements to the capability of municipal treatment plants
Water Quality Act of 1987	Established the Clean Water State Revolving Fund Encourage states to develop nonpoint pollution management plans

Source: Copeland (2003)

From 1956 to 1972, several laws were passed to expand federal authority over water quality regulation. The most notable was the Water Quality Act of 1965, which required states to set standards for interstate waters and to develop standards for pollution levels and control requirements. However, the perception of regulations as time-consuming and ineffective, slow clean-up efforts, and increased public interest in environmental issues lead to pressure for a major overhaul of water quality control efforts. The perceptions of ineffectiveness coupled with growing public awareness and major environmental catastrophes were the major impetus for reforms in 1972 (Copeland, 2003).

On June 22, 1969, the Cuyahoga River caught fire as a result of the industrial pollution and fuel oil present from years of active pollution (Adler, Landman, and Cameron, 1993). An August 1969 Time magazine article claimed the river "oozes rather than flows" ("The Cities," 1969). The environmental movement clasped onto such incidents as a testament to the need for reform (Adler, Landman, and Cameron, 1993). There was a significant reorganization and expansion of clean water regulation in 1972 with amendments to the Federal Water Pollution Control Act of 1948. Amendments in 1972 continued some of the basic aspects of existing law, as well as:

> "set optimistic and ambitious goals, required all municipal and industrial wastewater to be treated before being discharged into waterways, increased federal assistance for municipal treatment plant construction, strengthened and streamlined enforcement, and expanded the federal role while retaining the responsibility of state for day-to-day implementation of the law" (Copeland, 2003, p. 3).

The 1972 amendments were a crucial turning point in water quality standards, taking on a new strength and legitimacy with the objective of restoring and maintain water quality in the nation's waters (EPA, "History of CWA").

The 1972 amendments are the most significant for the establishment of the framework for water pollution control. The 1972 amendments established the basic structure for pollutant discharge regulation including permitting for point source pollution into navigable waters, establishing the EPA's regulatory authority over water quality standards in surface and waste waters, and planning for nonpoint source pollution control (Copeland, 2003; Copeland, 2010). The current water quality control scheme is focused on point source pollution of navigable waters. Point sources are "discrete conveyances such as pipes or man-made ditches," which directly pollutant navigable waters. Point sources such as industrial or municipal (such as municipal sewage systems) must be permitted to release pollutants (EPA "Summary of CWA"). Plans to control non-point sources are developed at the state level to address the needs of the individual states, but overseen by EPA (Copeland, 2003; Copeland, 2010). The 1977 amendments introduced the common name of the Clean Water Act to the federal regulatory provisions, expanded regulations and EPA authority, and provided additional funding for wastewater treatment (EPA "History of the CWA").

In 1981, amendments were adopted to the municipal construction grants process. The Municipal Wastewater Treatment Construction Grants Amendments aimed at improving the capabilities of treatment plants to be built under the program (Copeland, 2003; Copeland, 2010). However, further changes were made in 1987 with the replacement of the municipal construction grant program with the State Water Pollution Control Revolving Fund, or the Clean Water State Revolving Fund, as the funding mechanisms for water quality projects through EPA-state partnerships (EPA "History of CWA"). Additionally, Water Quality Act of 1987 encouraged states to further develop programs for nonpoint pollution sources and to pursue efforts to protect groundwater. Previous water quality efforts had focused mainly on point source pollutions (Copeland, 2003; Copeland, 2010). The CWA began with a meager attempt by the federal government to regulate water quality, but has evolved into a major environmental protection scheme over the last six decades.

In its current form, the CWA is composed of two major parts aimed at addressing the components of the federal water quality management strategy. The first is the regulatory requirements established throughout the Act that apply to the management of pollutant discharge, which constitutes the mass of both CWA provisions and the interest for this analysis. The second is the provisions of Title II and IV governing the federal financial assistance programs for municipal sewage treatment plant construction. A philosophy of federal-state partnership is utilized by the CWA with the federal government setting the agenda and standards, and the states carry out the implementation and enforcement (Copeland, 2003; Copeland, 2010). The ultimate responsibility for enforcement of the CWA falls to the EPA, but the lack of resources for the day-to-day management of implementation, enforcement, and oversight along with the delegation of permitting results in the states being the de facto governing entity of the CWA. As such, the majority of the actions taken as part of the CWA are undertaken by the states as the states issue the majority of discharge permits and manages the day-to-day enforcement of the legislative provisions. However, the EPA maintains oversight of state efforts and retains the right to overrule or bypass the states if the state has failed to appropriately execute their responsibilities (Ryan, 2003).

The majority of the CWA is dedicated to the management of pollutant discharge into the nation's surface waters. Section 304 requires EPA to develop water quality criteria that reflects the latest scientific knowledge. The criteria are based on scientific data and judgments of pollutants concentrations and their effects on environmental and human health (EPA "Water Quality Criteria"). The goal of water quality standards is to convert the CWA goals into specific objectives, applied to the surface waters of the United States (EPA "Introduction to CWA"). Water quality criteria have been established for more than 115 different pollutants and 65 categories of toxic chemicals or priority pollutants by the EPA. Additionally, states are required to establish standards for all waters falling under their jurisdiction, and have the discretion to develop their own water quality standards based on local concerns (Copeland, 2003; Copeland, 2010). These water quality standards are achieved through the management of point source and nonpoint source pollution management. Water quality standards are the standards for the overall water quality, rather than for specific sources (Ryan, 2003).

Point source pollution has been the focus on water quality management programs. The primary mechanism for controlling point source pollution has been the use of discharge permitting. All discharges from municipal or industrial sources into the nation's waters must be authorized with a permit. Currently, there are more than 65,000 dischargers permitted by the EPA or the states (Copeland, 2003; Copeland, 2010). The NPDES permits are based on the requirement of technology-based effluent limits for dischargers. Permits require control technologies applicable for each pollutant, limitations for effluent pollutants, and compliance deadlines (Ryan, 2003).

The permit requirement makes the CWA a "technology-forcing statute" in essence. Dischargers are required to use more and more sophisticated technology to abate pollution. By July 1, 1977, industrial and municipal dischargers were required to utilized "best practicable control technology" (BPT) for the control of conventional pollutants, such as suspended solids, biochemical oxygen demanding materials, fecal coliform and bacteria, and pH. As biodegradable substances, conventional pollutants occur naturally and effect the aquatic environment by depleting oxygen concentrations in the water necessary for aquatic life. By March 31, 1989, industrial and municipal dischargers were required to utilize “best available technology” (BAT) that is economically viable, to control toxic substances. Toxic substances are non-naturally occurring and effect the environment through contamination, and have been a key focus for water quality programs (Copeland, 2003; Copeland, 2010). Along with requirements for technology, effluent limitations are established by EPA for both pollutants and sources, with the EPA holding broad jurisdiction. For waters that are expected to remain polluted with toxic chemicals after the adoption of the BAT by industrial dischargers, states are required to develop programs to come into compliance with water quality standards (Ryan, 2003).

The issuance of permits has been delegated to 46 states. EPA only issues permits in Idaho, Massachusetts, New Hampshire, and New Mexico (Copeland, 2010). Thus, the crux of the point source pollution programs has been delegated to and is managed by the states. Section 401 provides states the powers to deny permits through the withholding of certification, and to establish conditions for certification and permits (Copeland, 2003). These powers provide the states with significant discretion in point source pollution management. As a result, state implementation has varied with some states viewing the powers under Section 401 as an important tool and others failing to do so.

Title III establishes two mechanisms for the management of water quality outside point source programs. First, Section 303(d) requires states to develop “total maximum daily loads” (TMDLs) for identified pollutants in contaminated water segments. TMDLs “set the maximum amount of pollution that a water body can receive without violating water quality standards” (Copeland, 2003, p. 34). If states fail to establish acceptable TMDLs, EPA is required to do so. The TMDL program has been highly controversial due to lack of state resources available to carry out the necessary analyses (Houck, 1999). Failure of states and EPA to properly develop and monitor TMDLs has resulted in lawsuits in 38 states. The conflict resulted in a 1999 proposal which required TMDLs to be established within 15 years, though this proposal was put on hold by the Bush Administration. The TMDL component of the CWA has remained to be fully implemented by the states and EPA (Copeland, 2003). Second, Section 319 requires states to develop and implement programs to control nonpoint sources of pollution. Nonpoint sources include rainfall runoff from farms, urban areas, construction, forestry, and mining sites. Nonpoint sources are believed to be responsible for a significant amount of water pollution. States are, additionally, required to identify specific waters that are not in compliance with water quality standards due to nonpoint sources and develop plans for the management of those sources (Adler, Landman, and Cameron, 1993; Copeland, 2003; Copeland 2010).

In addition to the pollutant discharge management provisions, the CWA includes programs for the financing of municipal sewage treatment plants. This financing is applicable for the planning, designing, and construction of sewage treatment facilities. Under the original program in Title II, grants were provided based on a complex statutory formula based on population and estimated funding needs. Under the Title II program, “grants were generally available for as much as 55% of total project costs. For projects using innovative or alternative technology (such as reuse or recycling of water), as much as 75% federal funding was allowed" (Copeland, 2010). Grants made under this program were not required to be repaid. In 1987, the Title II programs were replaced with the Clean Water State Revolving Fund. Under the new program, states were to contribute matching funds to the revolving fund starting in 1989 (Copeland, 2003; Copeland 2010). Grants provided for treatment plant construction is repaid to the state fund for the use in financing future projects, under the revolving loan fund concept (Adler, Landman, and Cameron, 1993). In essence, the shift from Title II to Title IV was a change from grants to loans for financing municipal sewage treatment plants.

Achieving clean water is not a black-and-water endeavor, thus the CWA has developed as a complex program to limit pollution in the surface and navigable waters of the United States. The CWA can be summed up as consisting of the basic provisions for water quality standards, and the Clean Water Revolving Fund for the construction of water treatment systems. The programs governed under the CWA have been implemented and managed by the state governments throughout its history, making it an interesting exercise in federalism. While the CWA does not garner as much attention as the CAA does, it remains as one of the most significant pieces of environmental legislation in the United States.

Measuring Effectiveness and Outcomes

Environmental indicators are meant to supply information on the environment, support environmental decision making, and monitor of the effects of those decisions (Smeeting and Weterings, 1999). Effective environmental indicators are capable of identifying environmental change, understandable to the public, limited in number, scientifically based and valid, relatively easy for data collection, and sensitive to space and time (Ward, 1990). However, developing measures to adequately and accurately measure environmental quality in the context of public programs has proven exceptionally difficult (Goggin et al, 1990; Ringquist, 1993b; Bartlett, 1994). Finding effective measures of environmental outcomes have been a source of major and continuing source of controversy in environmental policy research (Lester, et al, 1983; Lester and Lombard, 1990; Ringquist, 1993b; Barlett, 1994).

Konisky and Woods (2011) is the most recent review of the extant literature of environmental policy geared towards evaluating the use of performance measures. Their study identifies four categories of state environmental efforts: programmatic indicators, government expenditures, abatement costs for private industry, and regulatory enforcement actions. These four strategies represent the mass of the research approaches to evaluating environmental policy effectiveness. The strategies carry the same design to measuring state effort, not policy outcomes. These types of dependent variables "are specifically not an evaluation of environmental quality in the states, nor are they an evaluation of the effectiveness of state programs" (Ringquist, 1993b, pg. 105).

Though the text is nearly two decades old, Ringquist's (1993b) assertion that "when it comes to evaluating the environmental outcomes of pollution control regulations, political science research is mostly silent" has remained strikingly accurate (pg. 96). The result is research has done little to determine if and to what extent air and water quality programs have effected pollution in the United States (Ringquist, 1993b). Measuring policy outcomes is a difficult endeavor. Developing measures of policy outcomes is a tradeoff between "the objects of measurement, the method of measurement, and the assumptions behind the measurements" (Ringquist, 1993b, pg. 93). These three issues highlight the crux of the difficulty in evaluating the effectiveness of environmental programs.

The structure of the CAA makes measurements of policy outcomes a less strenuous endeavor, than the structure of the CWA. First, Ringquist (1993b) argues "deciding on the objects of measurement in air quality is relatively easy since almost all regulatory efforts over the past twenty-five years have been aimed at reducing emissions and concentrations of six criteria pollutants" (p. 93). Ironically, pollution has been more readily employed as an independent variable to predict environmental efforts, than as a dependent variable to evaluate effectiveness of those efforts (Davis and Feiock, 1992; Lester and Lombard, 1990; Lombard, 1993; Bacot and Dawes, 1997; Breaux et al, 2010). While more than 2800 air pollutants have been identified (Fenger, Hertel, and Palmgren, 1999), the six criteria pollutants regulated by the NAAQS are the most common measures of environmental outcomes. When assessing the performance of the CAA, the criteria pollutants have been a popular choice for measuring effectiveness (Ringquist, 1993a; Ringquist 1993b; Lester, 1997). Additionally, these same pollutants have been employed for the measurement of air quality in Europe (Fenger, Hertel, and Palmgren, 1999). The differences in the CAA and CWA have also translated into different monitoring efforts. The six criteria pollutants of the CAA are widely monitored across the nation, but water pollutant monitoring is significantly dependent on local environmental conditions. There is much less continuity and consistency in the monitoring of specific pollutants in water quality compared to air quality.

Second, the methods of measurement for the six criteria pollutants have been well developed by environmental scientists in the latter half of the 20th century, with national and international monitoring programs established to track pollution (Fenger, Hertel, and Palmgren, 1999). EPA has created the AQS Data Mart for the specific purpose of collecting and disseminating measurements and indicators of an extensive list of air pollutants (EPA "AQS Data Mart"). These measures can be aggregated to fit jurisdictional limits to access environmental outcomes relative to policy (Fenger, Hertel, and Palmgren, 1999). Third, by measuring the six criteria pollutants, research carries the same assumptions in measurement as the CAA. Thus, when assessing the effectiveness of policy there is not a difference in the logic between used by administrators implementing a law and researchers analyzing their efforts. Evaluating the results of the CAA should focus on the criteria pollutants, as the most effective balance of the issues surrounding measurement, as the data is readily available and the focus of the legislation.

Based on the evaluations focusing on criteria pollutants as measures of effectiveness, the CAA has proven to be overall effective, but with significant disparities across states. David Driesen, Associate Professor at Syracuse University College of Law, began his 2002 testimony before the House Committee on Energy and Commerce by asserting "I'm pleased to report that the 1990 Amendments have improved public health and ameliorated environmental impacts. We have reduced emissions of most of the pollutants the Amendments target, often quite substantially." Relying heavily upon state regulation, the partnership between the states and EPA has "made significant progress in protecting public health and the environment" (Driesen, 2011).

Since 1970, air regulations stemming from the CAA and its subsequent amendments have reduced emissions of the six principal criteria pollutants over the same period that U.S. gross domestic product rose by over 200% (EPA, 2008). From 1990 to 2007, the six criteria pollutants have seen the following reductions: 9% for ozone (O3), 11% for fine particulate matter (PM2.5), 28% for coarse particulate matter (PM10), 80% for lead (Pb), 35% for nitrogen dioxide (NO2), 67% for carbon monoxide (CO), and 54% for sulfur dioxide (SO2) (EPA, 2008). In 2011, the third evaluation report of the CAA by the EPA estimated that reductions in fine particle and ozone pollution as a result of the CAA amendments of 1990 have prevented 160,000 cases of premature mortality, 130,000 heart attacks, 13 million lost work days, and 1.7 million asthmas attacks (EPA, 2011). In 2008, a report from the Office of Management and Budget (OMB) estimates annual program costs at between $26 billion and $29 billion, with annual benefits between $70 billion and $573 billion (OMB, 2009). The 2011 EPA report estimates the annual economic benefits of the CAA amendments will reach nearly $2 trillion by 2020, with annual implementation costs only $65 billion (EPA, 2011). The provisions of the CAA have improved and are likely to continue to improve both public health and environmental quality (Hubbell, et al, 2010).

However, as air quality standards have become more stringent many states have experienced problems with maintaining compliance (Edwards, 2004). Progress in many states, nevertheless, has not met the success envisioned in the adoption of the 1990 Amendments (Driesen, 2011). While states have seen success in implementation, "compliance with certain standards has proven to be considerably challenging to particular states and areas with higher concentrations of certain pollutants" (Edwards, 2004, p. 1). The CAA has proven successful overall, but the results remain uneven across the states due to the reliance on state implementation which has proven inconsistent.

The CWA does not provide the same parsimonious structure for evaluating policy effectiveness as the CAA. There are no analogies between the CAA criteria pollutants and water quality. Rather than a truncated list of six criteria pollutants, EPA has a list of more than 100 pollutants monitored for water quality (Copeland, 2010), including "biochemical oxygen demand, dissolved oxygen, suspended sediments, suspended or dissolved solids, nutrient loads, pesticide residues, inorganic toxins, heavy metal ions, or countless other constituents" (Ringquist, 1993b, p. 95). Additionally, provisions under Title II and IV provide an element of consideration, separate from simple pollutant concentration standards. Thus, the object of measurement is a notable obstacle in water quality.

In accordance with the nature of water quality regulation and the CWA, Adler, Landmark, and Cameron (1993) note two traditional methods for evaluating the CWA. First, similar to air quality, is to determine whether levels of the more common pollutants have changed over time. Dissolved oxygen, total dissolved solids, and phosphorus, in particular, have proven to be popular choices (Ringquist, 1993b; Lester, 1995). Second, "is to count the numbers of new treatment systems installed and the pounds of pollutants removed by those systems" (Adler, Landmark, and Cameron, 1993, pg. 14). This strategy is a measurement specifically of the implementation of the provisions of Clean Water Revolving Fund, rather than the CWA in general. Interestingly, new treatment systems can be seen as both a measure of environmental efforts and as policy outcomes under the CWA (Morris, 1999; Travis, Morris, and Morris, 2004; Morris, 2010). However, as the provisions under Title II and IV substantiate a major portion of the CWA, these measures are equally as important in assessing effective implementation.

While the object of measurement for the CWA is not as simple as for the CAA, changes in levels of the most common pollutants and the development of treatment systems as the crux of the legislative provisions are as close to an analogy to the criteria pollutants as possible. Additionally, focusing on the provisions of the CWA for the object of measurement, ensures the assumptions are of the research are the same as the legislative directives. Finally, it should be noted that the United States Geological Survey (USGS) maintains the National Water Information System as a means to standardize and collect data on national water quality (USGS "NWIS"); it serves a similar function as EPA's AQS Data Mart. Thus, the measurement and collection of this data has experienced a standardization further aiding research. Assessing the effectiveness of the CWA is by no means a simple task, but the issues mentioned by Ringquist (1993b) can be addressed with relative ease.

Both the provisions for water quality standards and the Clean Water Revolving Fund have proven to be effective, but unevenly implemented (Andreen, 2004). According to EPA, "the evidence is overwhelming that the regulatory and policy design of the CWA has achieved significant successes in many waterways" (EPA, 2000). There has been "considerable progress in reducing the total amounts of pollution reaching U.S. surface waters from specific sources" (Adler, Landmark, and Cameron, 1993, p. 17). Rivers and lakes in urban and industrialized areas exposed to point source discharges have experienced the greatest improvements (Andreen, 2004). The provisions for point source discharges from municipal and industrial wastewater treatment plants have been particularly successful, as well (Adler, Landmark, and Cameron, 1993; Sanudo-Wilhelmy and Gill, 1999). Additionally, there has been significant progress made in the number of new water treatment systems and the pounds of pollutants removed from the system, which is one of the traditional measures used to judge success of water quality regulation (Adler, Landmark, and Cameron, 1993).

However, data from the National Stream Quality Accounting Network (NASQAN) managed by the United States Geological Survey (USGS) shows no significant trends in either direction for water quality from 1978 to 1987 (Adler, Landmark, and Cameron, 1993). Moreover, there remain some shortcomings in implementation, progress, and results for the CWA; critics have not been fully satisfied with the results (Adler, Landmark, and Cameron, 1993; Andreen, 2004). Nevertheless, Adler, Landmark, and Cameron (1993) contends "all this information, taken together, confirms that progress has been made in reducing the release of some pollutants by some sources" (p. 22). Progress has been asymmetrical as states have taken on different approaches to implementation (Morris, 2010). The reductions that have been produced have improved water quality overall in some waters. No data has indicated any type of widespread trend reflecting deterioration in U.S. water quality (Adler, Landmark, and Cameron, 1993). Thus, at the very least, the CWA has managed to stabilize water quality in many waterways. The CWA has found noteworthy success, but it has proven to be unequal across the country.

The nature of environmental policy exacerbates the already difficult task of evaluating policy outcomes. As the CAA and CWA are both highly complex pieces of legislation, this makes measuring their effectiveness an arduous task. However, the basic provisions of the CAA and CWA focus on delineated objectives for policy implementation. Looking at these objectives as measures of effectiveness allows researchers to carry the legislative assumptions into assumption about the implementation process, and determine if the legislation is actually achieving its stated goals. Current research indicates that both the CAA and CWA have made significant progress in creating clean air and water, but suffer from uneven implementation by state governments.

Following the discussion of measuring effectiveness of air and water protection efforts, it may be advantageous to provide the ideal specifications for a dependent variable in this research. There are three sets of specifications that will ideally be satisfied. First, the indicators will be capable of identifying environmental change, limited in number, scientifically based and valid, relatively easy for data collection, and sensitive to space and time. The first set describes a wide variety of indicators developed by government agencies and environmental scientists. Second, the indicators need to be routinely monitored and commonly measured across the nation, as well as capable of being aggregated to the state level. The second set is necessary for the nature of the current analysis as an evaluation of state-level efforts across the country over a decade. Finally, the indicators need to be as closely aligned with the governing legislation as possible. State agencies are responsible for goals that are tied to governing legislation. Deviating from the goals in which they are working would likely create a skewed analysis of the effects of their efforts, just as testing students in an Introduction to College Algebra course on their knowledge of political science may present a skewed analysis of the effectiveness of mathematics professors would. Ideally, all three sets of specifications can be satisfied by dependent variables in this analysis.

CHAPTER 3

THE CONTEXT OF ENVIRONMENTAL POLICY AND ADMINISTRATION

The intent of this chapter is to present a review of state politics research into environmental policy outcomes. A review of the existing findings of the political effects on environmental policy outcomes both provides a background into state environmental policy research and will form the basis for a theory of the effects of state politics on environmental policy outcomes. The dominant strain of literature in state environmental policy stems from the state politics approach. State politics research has proven to be diverse and disjointed in theory, methodologies, and findings. However, the principal theoretical assumption shared within this approach is that conditions within the political context of individual states accounts for the variation in environmental conditions and approaches of state governments (Ringquist, 1993b). Much of the research in this area attempts to explain differences in environmental efforts by state governments, rather than environmental outcomes (Konisky and Woods, 2011). However, the theoretical underpinnings of these works clearly carry implications for the purposes here. There are three classes of models within the state politics approach to note: economic, political, and cultural. The economic and political models have proven to be the most popular among researchers, but cultural models do have noteworthy explanatory potential. While the elements of each class of model cannot be said to stand alone in its implications for government operations, this categorization presents the most straightforward review of the literature to inform theory and analysis. This chapter will proceed in first with an overview state politics research; then, with three parts dedicated to each class of model. Finally, a brief introduction to an integrated model of policy outcomes will be presented. Further development of the model will occur in subsequent chapters.

The State of State Politics Research

The field of state politics research is effectively summed up by Brace and Jewett (1995):

> "Reviews of the state politics subfield typically deplore the field's lack of progress and complain about the disunity in approaches and subject matter that characterize the field's research… Consequently, the field's research moves forward, but in a disjointed fashion, often marking progress largely by recording an ever expanding set of empirical findings about state elections, institutions, policymaking, and so on" (p. 643 – 644).

Research into the state politics and the contextual effects of differently social, economic, and political circumstances has long been an interest among political scientist. V.O. Key's (1949) notable work into Southern politics starts with the basic assumption that contexts effect behavior, from which he conducts case studies on several states to indicate both similarities and differences in dealing with parallel issues. However, research into state government and politics has always taken a secondary role to the more prominent issue of national politics (Jewell, 1982; Brace and Jewett, 1995; Stonecash, 1996). In the aptly titled "The Neglected World of State Politics," Jewell contends state politics while receiving attention from some political scientist, it ultimately has been placed as too low of a priority in the field and subsequently too few resources have been dedicated to its research (Jewell, 1982).

State politics as a subfield has distinct advantages for developing knowledge about the politics, policy, and administration (Jewell, 1982; Ringquist, 1993). First, state politics and policy are in a continuous state of change. In New State Ice Co. v. Lieberman (1932), Louis Brandeis argued "a single courageous state may, if its citizens choose, serve as a laboratory; and try novel social and economic experiments without risk to the rest of the country." Many states have put their capacity as a "laboratory for democracy" to good use, through innovations in policy and administration (Rabe, 2010). The Devolution Revolution has only led to a stronger power of state governments to innovate with their new found discretion (Van Horn, 1996).

Second, the diversity of state government provides special opportunity for testing hypotheses about political processes, institutions, and contexts (Jewell, 1982; Brace and Jewett, 1995; Stonecash, 1996). Studies in state politics have been instrumental in expanding knowledge in political cultures, institutions, actors, and policies that have broader implications (Stonecash, 1996). Sharkansky and Hofferbert (1969) contend "the effort to explain why politics and policies differ from one state to the next may be helped considerably by examining the dimensions lying beneath readily measured variables" (p. 879). Of particular emphasis in state politics research has been the role of economic factors in policy decisions, which has attracted the attention of state politics scholars (Brace and Jewett, 1995). While some authors have tried to determine a preeminence of social, economic, or political factors over the others (Dawson and Robinson, 1963; Dye, 1966; Lewis-Beck, 1977), others argue there is multidimensionality to the influence of contextual economic, social, and political variables (Sharkansky and Hofferbert, 1969). No single unifying theory or framework exists, though (Brace and Jewett, 1995). A wide range of variables, theories, and methodologies have been employed producing a litany of results, some of which are complementary and others that are contradictory (Brace and Jewett, 1995). The end result is a glut of testable hypotheses about the nature of politics and policy relative to the economic, political, and cultural contexts.

Since the early 1990's, more attention has been paid to state environmental efforts, policy, and management by scholars (Lester and Lombard, 1990; Ringquist, 1993; Lester, 1994). Such research has become more prominent in the literature as a result (Ringquist, 1993). However, much of this research has followed the trend of disjunction that is prevalent in state politics (Brace and Jewett, 1995; Stonecash, 1996). Most commonly, researchers look toward the effects of these contextual factors in predicting environmental efforts by states (Konisky and Woods, 2004). Few have taken the further step to predict policy outcomes, or environmental outcomes (Ringquist, 1993; Konisky and Woods, 2004). The existing literature indicates the economic and political circumstances of states have a notable impact on environmental institutions, efforts, and outcomes (Williams and Matheny, 1984; Lester and Lombard, 1990; Ringquist, 1993; Konisky and Woods, 2004). While not as developed in the area of the environment, there are strong implications that culture plays an important role as well (Elazar, 1984; Woods, 2006; Emison and Morris, 2010).

Economic Models

The rush towards comparative state politics research was spurred by Dawson and Robinson (1963), with findings that carried dramatic implications for political scientists. In analyzing welfare programs across states, Dawson and Robinson (1963) found variation in policy was best explained by economic development, rather than by interparty competition. The finding was a direct attack on the theories of party competition, affiliation, or control as the impetus for variation in state policies; an approach to state politics that had been widely accepted since V.O. Key's seminal work on Southern politics. (Key, 1949). Hofferbet (1966) and Walker (1969) made similar findings in education expenditures and policy innovation, respectively. However, Thomas Dye made one of the most important contributions to the economic approach to state politics research when he wrote:

> "Economic development shapes both political systems and policy outcomes, and most of the association that occurs between system characteristics and policy outcomes can be attributed to the influence of economic development. Differences in the policy choices of states with different types of political systems turn out to be largely a product of differing socioeconomic levels rather than a direct product of political variables" (Dye, 1966, p. 293).

These empirical findings presented a new approach to analyzing differences in state policy, but ultimately lacked the theoretical rigor associated with their counterpart political theories.

The conventional wisdom surrounding economic variable effects on policy outputs is that economic development creates resources available for states allowing them to undertake more elective public programs (Ringquist, 1993b). In a world of scarce resources, the resources of government will always be limited by the level of the society's economic development (Anderson, 2011). In the case of states with low economic development, resources available to the state are limited to the point that only basic public services can be provided. In a complementary argument, economic development creates a more progressive set of demands for services from government.

More economically developed jurisdictions are more likely to value quality-of-life assets associated with progressive programs (Kincaid, 2006). Abraham Maslow's Hierarchy of Needs creates a suitable analogy for the relationship between economic development and public attitudes. In essence, the Maslow's hierarchy contends that the most basic needs must be met first before more advanced needs can be met. For the individual, this means that physiological needs must be satisfied before safety, love, or esteem needs can be satisfied (Maslow, 1943). For states this means, basic public services, such as law enforcement or education, have to be satisfied before more advanced needs, such as e-government, can be satisfied. In states with limited resources providing the basic needs is the focus, while states with more advanced economies have the available resources to effectively provide the basic services and can, therefore, dedicate efforts to more advanced needs. Essentially, economic development creates a different set of pressures for public officials stemming from public needs and available resources.

A less prominent theoretical approach in state politics research suggests that economic development has a direct impact on political structures (Ringquist, 1993b). There is no dearth of literature that suggests there is a crucial interplay between economic and political structures (Balibar, 1995), or that economic interests play an insurmountable role in shaping political systems (Lindblom, 1977). The literature on democratization, for one, contains a long history of theory contending economic development is a direct prerequisite of democratic institutions (Przeworski et al, 2000). In this case, scholars contend the economic structures and interests and shaping the political institutions and, therefore, the policies resultant from those structures.

However, the economic approach to explaining differences in state governments suffers from a considerable theoretical flaw: there is little explanation for how this economic development translates into government efforts. It is clear there is some intervening mechanism between the state economy and government actions that theorists have not effectively identified (Ringquist, 1993b). Economic development by itself cannot trigger changes in policy outcomes. Scholars of this field of inquiry seem to identify the connection between economic development and policy outcomes without attempts to explain the means by which it occurs. Accordingly, Ringquist (1993b) contends "the consistent results presented by these researchers begin to look less like revelations of underlying patterns of political behavior and more like fortuitous correlations or examples of misspecified models of policy influence" (p. 83). Thus, while there are ample results confirming a relationship between economics and policy outcomes, this theoretical approach is incapable of sufficiently explaining the differences of state policy outcomes.

Despite the lack of comprehensive theory, a range of economic variables have been employed in a litany of studies examining elements of state environmental policy and administration. Though these variables have been operationalized in different forms, the substantive concepts they represent has been proven to be a substantive predictor in the analysis of numerous areas of state environmental policy, including air and water quality, toxic and hazardous substance regulation, overall state environmental efforts, or environmental policy adoption to name a few (Konisky and Woods, 2011). The most prominent of these variables have been aimed at capturing economic development and structure, such as economy by sector (Lester et al, 1983; Williams and Matheny, 1984;

Ringquist, 1993a; Ringquist, 1993b; O'Toole et al, 1997; Saleska and Engel, 1998; Grant, Bergeson, and Jones, 2002; Grant and Jones, 2003; Millimet, 2003; Sapat, 2004; Daley and Garand, 2005; Hoornbeek, 2005; Johnson, Brace, and Arceneaux, 2005; Woods, 2006; Stafford, 2006; Konisky, 2007; Newmark and Witco, 2007; Chintrakarn, 2008; Woods, Konisky, and Bowman, 2009), income (Lester et al, 1983; Ringquist, 1993b; Guth et al, 1995; Hays, Esler, and Hays, 1996; Saleska and Engel, 1998; Stafford, 2000; Fredriksson and Millimet, 2002a; Frediksson and Milimet, 2002b; Levinson, 2003; Sapat, 2004; Daley and Garand, 2005; Hoornbeek, 2005; Johnson, Brace, and Arceneaux, 2005; Shapiro, 2005; Konisky, 2007; Konisky, 2009; Breaux et al, 2010; Konisky and Woods, 2010), gross state product (Bacot and Dawes, 1997; Saleska and Engel, 1998; Levinson, 2003; Woods, 2006; Woods, 2008; Emison, 2010), and economic growth (Williams and Matheny, 1984; Feiock and Rowland, 1990; Woods, 2006).

Alongside economic development, demographic variables have proven to be a popular choice, including population (Bacot and Dawes, 1997; Stafford, 2000; Fredriksson and Millimet, 2002a; Fredriksson and Millimet, 2002b; Potoski and Woods, 2002; Levinson, 2003; Hoornbeek, 2005; Stafford, 2006; Konisky, 2007; Konisky, 2009; Konisky and Woods, 2010), population density (Gray and Shadbegian, 1998; Fredriksson and Millimet, 2002a; Fredriksson and Millimet, 2002b; Daley and Garand, 2005; Shapiro, 2005; Konisky, 2007; Newmark and Witco, 2007; Konisky, 2009; Konisky and Woods, 2010), minority population (Grant, Bergeson, and Jones, 2002; Grant and Jones, 2003; Shapiro, 2005; Woods, Konsiky, and Bowman, 2009; Konisky and Woods, 2010), population living in poverty (Lester et al, 1983; Grant, Bergeson, and Jones, 2002; Grant and Jones, 2003; Woods, Konisky, and Bowman, 2009; Konisky and Woods, 2010), population living in urban areas (Guth et al, 1995; Fredriksson and Millimet, 2002a; Fredriksson and Millimet, 2002b; Konisky, 2007; Konisky, 2009), and land area (Stafford, 2006; Newmark and Witco, 2007).

Some studies have complimented the economic development and demographic approach by including the fiscal situation of the state government with measures of fiscal health (Williams and Matheny, 1984; Hays, Esler, and Hays, 1996; Bacot and Dawes, 1997; Konisky, 2007; Newmark and Witco, 2007; Konisky, 2009), tax rates or capacity (Feiock and Rowland, 1990; Stafford, 2000; Cline, 2003), or expenditures on environmental programs (Lester et al, 1983; Ringquist, 1993a; Ringquist, 1993b; Stafford, 2000; Potoski and Woods, 2002; Travis, Morris, and Morris, 2004; Shapiro, 2005; Stafford, 2006; Abel, Stephan, and Kraft, 2007; Woods, Konisky, and Bowman 2009; Emison, 2010).

Other studies have attempted to peer further into the state economy, with unemployment rates (Saleska and Engel, 1998; Levinson, 2003; Konisky, 2007; Chintrakarn, 2008; Konisky, 2009; Konisky and Woods, 2010), employment in industrial or manufacturing sectors (Hays, Esler, and Hays, 1996; Cline, 2003; Millimet, 2003; Shapiro, 2005; Chintrakarn, 2008), number or size of manufacturing plants (Millimet, 2003; Konisky, 2007; Konisky and Woods, 2010), pollution emissions (Lester et al, 1983; Ringquist, 1993b; Bacot and Dawes, 1997; O'Toole et al, 1997; Gray and Shadbegian, 1998; Potoski and Woods, 2002; Sapat, 2004; Daley and Garand, 2005; Stafford, 2006; Breaux et al, 2010), energy consumption and prices (Feiock and Rowland, 1990; Ringquist, 1993a; Ringquist, 1993b; Gray and Shadbegian, 1998; Stafford, 2000), education (Guth et al, 1995; Stafford, 2000; Daley and Garand, 2005;

Shapiro, 2005; Abel et al, 2007; Konisky and Woods, 2010), or housing market indicators (Levinson, 2003; Shapiro, 2005).

The economic approach to explaining differences in policy outcomes has been a popular choice among political scientists across policy areas for several decades. The variables employed have been wide ranging, but do carry some substantive value in predicting variations in policy outcomes. However, the theory has not kept pace with the results. The connection between socio-economic variables and policy outcomes has not been properly linked by theorists, leaving many questions when relying solely on these variables to predict policy differences. Nevertheless, it cannot be argued that economics does not play a very important role in shaping policy outcomes, and cannot be ignored in any analysis that seeks to explain variations in policy.

Political Models

The growing popularity of economic models required those advocating more political models to refute the importance of economic variables and re-establish the value of political variables in comparatively analyzing states. According to Ringquist (1993b) "political scientists have made efforts toward resurrecting political structures and institutions as important factors accounting for policy outputs, rescuing the relevance of institutionally oriented policy research at the same time" (p. 84).The mantle was taken up by political scientists who were critical of the underlying theory associated with the economic approach. The result was an emphasis on developing more sophistication in both theory and methods. Sharkansky and Hofferbert (1969) contend the failure of the politics approach during this era was a lack of sophistication in capturing the political variables, i.e. "electoral imbalance or alternation in office is not inter-party competition" (p. 867). Political scientists were forced to develop more intricate explanations for state policymaking from the politics side, and operationalizations of these concepts.

Sharkansky and Hofferbert (1969) argued for a causal relationship among affluence, industrialization, and public policy, with party competition and voter turnout to be significant factors in affluence. Economic affluence was providing greater power in the political system to certain groups who sought policy ends relative to their opinions. While some economic variables could capture the imbalance in affluence, theories were not accurately explaining the relationship. Jennings (1979) argues it was the party cleavages, more than party labels that explained policy variations. Again, this is an attempt to become more sophisticated with the political models.

The most notable expansion of the politics approach as superior to the economics approach is Erikson, Wright, and McIver (1989). As socio-economic variables tend to be major predictors of public opinions, Erikson, Wright, and McIver (1989) contend the economic variables used are simply stand-ins for public opinion. In seeking to use a more refined operationalization of public opinion, they find state opinion liberalism has strong relationship with public policy in the states, and economic development variables fall into insignificance once public opinion is controlled for. Similarly, both Fry and Winters (1970) and Plotnick and Winters (1985) find that when controlling for economic conditions, political variables have prove to be much more relevant to public policy than being let on by the scholars of the economic approach. The findings of these scholars indicates: "politics, it seems, does matter, even when controlling for levels of wealth and economic development" (Ringquist, 1993b, p. 84).

Without dwelling too much on the specific theoretical arguments, the political approach relies on the assumption that political factors in society, rather than economic factors, are driving the operations of government through a direct relationship. Some would contend this takes place through competition among political parties (Sharkansky and Hofferbert, 1969); others, as a manifestation of public opinion (Erikson, Wright, and McIver, 1989). Additionally, there are others who maintain policy and regulation are the result of the equilibrium achieved between group conflicts (Truman, 1951; Dahl, 1956; Lowi, 1979). In sum, parties, interest groups, public opinion, and politics matters in policy making, while the economic variables only severe as surrogates for the political components, or describe the environment in which the political actors function. For example, the relative strength of economic sectors would be a manifestation of affluence of certain political interests, and state fiscal health would be a manifestation of relative resources. Explaining variations in policy across states is reliant on capturing the interrelationship between the political actors and their multidimensional influences on each other (Sharkansky and Hofferbert, 1969). It is the interrelationship between political actors in which policy decisions are made, whether it is resultant of conflict between groups or political parties. The political approach provides a much stronger theoretical structure for explaining the variations between states, because it can provide an explanation for how these variables are policy outcomes and not just point to correlations.

Though these variables have been operationalized in different forms, the substantive concepts they represent has been proven to be a substantive predictor in the analysis of numerous areas of state environmental policy, including air and water quality, toxic and hazardous substance regulation, overall state environmental efforts, or environmental policy adoption to name a few (Konisky and Woods, 2011). Variables have most prominently been aimed at capturing public attitudes relative to the environment. Studies have focused on ideology (Guth et al 1995; Hays, Esler, and Hays, 1996; Bacot and Dawes 1997; Cline 2003; Daley and Garand 2005; Johnson, Brace, and Arceneaux, 2005; Abel, Stephan, and Kraft, 2007; Konisky 2007; Newmark and Witco 2007; Stoutenborough and Beverlin 2008; Konisky 2009; Breaux et al 2010; Emison 2010), and public opinion (Ringquist 1993a; Sapat, 2004; Hoornbeek 2005; Johnson, Brace, and Arceneaux, 2005; Woods 2006; Woods 2008) as the most clearly identifiable encapsulations of public attitudes.

However, group membership has also been widely used, as membership in environmental groups (Williams and Matheny 1984; Ringquist 1993a; Hays, Esler, and Hays, 1996; Bacot and Dawes 1997; Stafford, 2000; Potoski and Woods 2002; Cline 2003; Sapat 2004; Daley and Garand 2005; Hoornbeek 2005; Stafford 2006; Woods 2006; Abel, Stephan, and Kraft, 2007; Newmark and Witco 2007; Woods 2008; Konisky 2009; Breaux et al 2010) or industrial groups or unions (Bacot and Dawes 1997; Potoski and Woods 2002; Chintrakarn 2008; Woods 2008; Breaux et al 2010) are strong predictors of attitudes. Additionally, measures of group membership can serve as a test of hypotheses relative to group theory.

Partisanship variables have also been relied upon to capture the state political environment, including state party affiliation (Guth et al 1995; Stafford 2000; Daley and Garand 2005; Hoornbeek 2005; Stafford 2006; Woods 2008; Emison 2010; Konisky and Woods 2010), and interparty competition (Lester et al 1983; Ringquist 1993a; Woods

2008; Breaux et al 2010). Additionally, efforts to capture the politics of the state institutions have been utilized with legislative professionalism (Lester et al 1983; Ringquist 1993a; Hays, Esler, and Hays, 1996; Cline 2003; Hoornbeek 2005; Stoutenborough and Beverlin 2008; Woods 2008), policy liberalism (Abel, Stephan, and Kraft, 2007; Emison 2010), and partisan control of state offices (Konisky 2007; Konisky 2009).

Cultural Models

Culture has not been as widely considered as a theoretical explanation for the variations between policy outcomes across states. However, it has been used to produce some interesting results that are worth noting. Culture is the most evasive of components relative to politics, but carries significant weight in influencing institutions, processes, and policies (Elazar, 1984; Fitzgerald and Hero, 1988; Laitin and Wildavsky, 1988; Mead, 2004). The most basic definition of culture is: a pattern of shared ideas, values, and beliefs (Macionis, 2001). These patterns have tremendous influence in predicting how the aggregate of individuals relate to government and the formulation of policy preferences (Elazar, 1984; Wildavsky, 1987; Laitin and Wildavsky, 1988; Fowler, Cosby, and Neaves, 2011). Thus, cultural should not be overlooked when analyzing the contextual environment of state government.

Daniel Elazar produced one of the most influential and controversial measures of political culture in American Federalism: A View from the States (1966/1984). Elazar's political culture has been widely used in previous studies to explain state government activities. Elazar (1984) argues that "each state responds to the system of government in their own way," creating a political culture as "the particular pattern of orientation to political action in which each political system is embedded." Elazar focused on the migration patterns in which individuals with shared beliefs, values, and ideas relocated in waves across the nation eventually settling in the neighboring areas (Elazar, 1984). By Elazar's (1984) own definitions of political culture, each state has its own approach to policy and administration dictated by the citizens orientation towards government, which in turn has significant implications for renewable energy policy innovation.

Elazar outlines three basic types of political culture: moralist, individualist, and traditionalist. First, individualist political cultures rely on the marketplace as the basis for democratic order. Access to the economic marketplace, encouragement for individuals to act innovatively, and restriction to the primarily economic realm are all criteria for the judgment of government in individualistic cultures. Policies are determined in response to public demand (Elazar, 1984). Second, moralistic political cultures rely on the common public good as the source of democratic order. Promotion of the public good is the primarily criteria for evaluating government in moralistic cultures. Policies are meant to promote broadest common welfare, regardless of public pressure (Elazar, 1984). Finally, traditionalistic politic cultures rely on elitism and paternalism in the democratic order, in which most individuals are too ambivalent to participate in government. Maintenance of the status quo and traditional patterns are the criteria for judging government in traditionalistic cultures. Policies are primarily determined by the elite (Elazar, 1984).

The connection between Elazar's measure of political culture and state government policy and activity has been made by a number of previous works.

Sharkansky (1969) presents a research note in which he argues for the tremendous explanatory power of the typology, and its potential for operationalizing an abstract concept. Mead (2004) contends "culture clearly matters for the performance of American states," with Elazar's political culture typology as the best indicator of state government characteristics (p. 286). Additionally, several articles have similar findings concerning the effect of political culture on government action. Both conclude Elazar's political culture has a distinct impact on state policy innovation with moralistic states having more liberal and innovative public policies and traditionalistic states producing less innovative, more conservative policies (Fitzgerald and Hero, 1988; Miller, 1991; Morgan and Watson, 1991; Johnson, 1976; Fowler and Breen, 2011). Furthermore, Elazar's model of culture has been applied to environmental policy, where it was found to be a substantive variable in state environmental policy and efforts (Blomquist, 1991; Travis, Morris, and Morris, 2004; Hoornbeek, 2005). While these works look specifically to the institutional form or policy innovation, Lester (1993) and Woods (2006) are directly applicable to administration.

Lester (1993) concludes political culture has considerable impact on the use of policy analysis and program evaluation in administrative decision-making. The findings indicate administrators in traditional states are much more likely to rely on peer advice, rather than analysis in making decisions regarding the administration of programs or implementation of policy. Woods (2006) finds state political culture to be among the most important predictors in the assumption of the burden taken on by state governments in the implementation of environmental legislation. Specifically, Woods (2006) indicates that traditionalistic cultures lag far behind that of moralistic and individualistic cultures in seeking the primary role in the administration of the Clean Air and Water Acts; in other words, traditionalistic states are more likely to defer to the federal or local governments in administration. Political culture, thus, has the potential to influence administrative decision-making as much as it does policymaking.

In addition to Elazar's concept, regionalism serves an important operationalization of culture. Walker (1969) captures the concept of regionalism to explain how political and economic similarities tend to fall short in explaining the variations among states, while geographically adjacent states tend to share characteristics of government and innovation regardless of political and economic circumstances. Later expansion of this concept, suggests the phenomenon can best be explained by shared patterns and approaches to government (Foster, 1978). Erikson, McIver, and Wright (1987) contend geographical location is extremely important in predicting public opinion, because it effectively serves as a substitute variable for culture. Culture types tend to cluster together in geographical areas (Elazar, 1984), allowing regional variables to capture cultural variation (Erikson, McIver, and Wright, 1987). There are significant region patterns and groupings in policy adoption and innovation, and administrative decision-making (Walker, 1969; Foster, 1978; Berry and Berry 1990; Berry and Berry, 1999). These patterns extend beyond initial decisions and into reinventing and reforming existing policies (Glick and Hays, 1991), and the adoption of administrative reforms (Berry, 1994). Environmental policy does not escape this effect, as region has been proven to be a substantive variable in these analyses as well (Bacot and Dawes, 1997; O'Toole et al, 1997; Newark and Witco, 2007).

The effects of regionalism are particularly pronounced in the southeastern states. Emsion and Morrison (2010) identify the southern states as being unique from the rest of the nation in environmental management, contending "Southerners have traditionally espoused a strong connection to their environment, a connection that runs deep in southern culture" (p. 2). The argument that the South maintains a distinct political culture is by no means new. V.O. Key's Southern Politics in State and Nation (1949) remains the seminal work in the field. Since its introduction, "a diverse literature developed over several decades has largely concluded that southern states tend to lag behind the rest of the nation in terms of a willingness to address new policy initiatives" (Emison and Morris, 2010, p. 2). However, Breaux et al (2002) and Breaux, Morris, and Travis (2007) find it is not an unwillingness to innovate but a different approach to innovation that distinguishes the South from the rest of the nation. The regional location of a state has profound effects on the operation of governments, because geographical variables capture cultural similarities and patterns in addition to the more obvious neighboring of states (Erikson, McIver, and Wright, 1987).

While there are different means to capture the concept, the underlying culture in which a state operates is an important catalyst for state action or inaction. As officials are responding to political pressures, culture plays a part in defining these pressures. While most would not lump regionalism into a discussion of political culture, geographic location is an operationalization of political culture (Erikson, McIver, and Wright, 1987), whether researchers realize this is the concept being operationalized or not. It is clearly observable that states within a given region share common attributes in their approaches and relationships to government. The cultural approach is not as popular of a choice for analysis as others, but should not be overlooked as it does carry the potential to predict, at least in part, variations across states in policy outcomes.

Conclusion

State politics research has developed within a tradition of competing schools of thought about the role of political and economic factors in effecting public policy. The economics approach discounts the role of political factors, as economics factors are more substantive and significant in predicting policy outcomes (Dawson and Robinson, 1963; Dye, 1966). The politics approach contends economic variables are just a surrogate for political factors, and lack the theoretical rigor to be effective (Sharkansky and Hofferbert, 1969; Erikson, McIver, and Wright, 1989). Alternatively, cultural models have not played nearly as significant of a role in state politics research, but findings on the role of political culture on government institutions have made it worth recognizing as a potential explanatory variable (Elazar, 1984; Fitzgerald and Hero, 1988; Mead, 2004). In the aftermath of a series of analysis from Dawson and Robinson (1963), Dye (1966), Hofferbert (1966), and Walker (1969) during the 1960's, state politics researchers were taken to task on reasserting the role of politics in the policy process. Many took up this challenge, but in doing so ignored many of the important findings that were emerging from the alternative school of thought (Shankansky and Hofferbert, 1969; Jennings, 1979; Erikson, McIver, and Wright, 1989).

The result is the competing approaches taken individually are incomplete at best. The economic approach, while substantively and significantly strong in explaining variations in policy across states, lacks a sophisticated theory to explain how economics translates into policy or government efforts. The politics approach, while theoretical and methodologically more sophisticated, has not deprived the economics approach of its substance. Of course cultural models, have not been well-developed enough to enter into the debate with any real force. Clearly, both political and economic characteristics have a tremendous influence over state governments and policies. When taken together, economics, politics, and culture create the agenda and resources establishing the boundaries for government action. Thus, "any comprehensive and realistic model of policy influence should include selected political and economic explanatory variables" (Ringquist, 1993, p. 84 – 85).

The first step toward a more complete model is the integrated model developed by Ringquist (1993b). He argues:

> "In brief, in the integrated model of state policy outputs, public policy is made by institutions within the political system. Actors within this system, however, are heavily influenced by organized interests placing policy demands on the government. The political system also faces constraints on what it can and cannot do in the area of public policy – fiscal constraints stemming from the economic characteristics of the state and political-electoral constraints from the general ideological disposition of its citizens" (91).

Contemporary state politics scholars have moved away from their disjointed approach to research, and attempted to integrate the competing concepts together. A well-structured debate between schools is a key to progress, as compared to previous eras of indifference or wars between schools (Pollitt, 2010). Several studies have utilized both political and economic variables in approaching environmental policy (Lester et al, 1983; Ringquist, 1993b; Guth et al, 1995; Hays, Esler, and Hays 1996; Bacot and Dawes, 1997; Cline, 2003; Hoornbeek, 2005; Johnson, Brace, and Arceneaux, 2005; Stafford, 2006; Woods, 2006; Konisky, 2007; Newmark and Witco, 2007; Konisky, 2009). These works have begun to integrate theories and variables within the state politics approach, but not from a wider range of policy theory.

State politics research provides the most substantive and extensive information on state environmental protection efforts. The state politics approach is by far the most well-developed theoretically and empirically in explaining the variation across states in environmental policy, so it was necessary to begin here as a basis for further analysis. However, political and economic variables alone cannot fully explain cross state differences in environmental outcomes. It would difficult to present a theory of environmental policy outcomes, without first charting why the mass of research on the topic has fallen short.

While Ringquist's integrated model is a step in the right direction, it is still heavily biased towards state politics. Ringquist's main effort is to integrate political and economic variables to explain interstate differences in environmental outcomes in clean air and water (the same goal this study hopes to accomplish). However, Ringquist's model is still limited to the state politics approach, which does not seem to recognize the overwhelming importance that implementation and administration have in determining policy outcomes (Ringquist, 1993b; Pressman and Wildavsky, 1973). There are two components that will be introduced in the next two chapters to augment the state politics approach to environmental policy: agency organization and policy implementation. Ringquist (1993) specifically calls attention to the managerial and institutional capacity of state governments, as does Cline (2003), Travis, Morris, and Morris (2004), and Breaux (2010). These studies, however, operationalize institutional capacity as single political variable, rather than delving deeper in underlying differences that can be captured between state bureaucracies. Agency structure and organization matters (Wilson, 1989). The external economic and political factors of the implementation process are paramount to outcomes, making it highly relevant to the state politics work present above (Sabatier and Mazmanian, 1980). Implementation takes place in the context of states, and implementation is a major driver of policy success (Pressman and Wildavsky, 1973; Sabatier and Mazmanian, 1980). Building from the foundation of the state politics approach, implementation and organizational factors will be used to better capture differences between states in environmental protection efforts.

CHAPTER 4

ORGANIZATION IN AGENCY PERFORMANCE

The intent of this chapter is to present a review of research focused on organizational structures and the effects on policy outcomes. A review of the existing findings of the organizational research both provides a background into the effects of structures on agency efficiency and effectiveness and will form the basis for a theory of the effects of organizational structure on environmental policy outcomes. Research into organizational structure was a key component in the classical foundations of public administration. However, interest in this approach faded as it had with scientific management (Fry and Raadschelders, 2008). Nevertheless, interest in this element of organizational theory reemerged in the 2000s with modern applications of Luther Gulick's work (Meier and Bohte, 2000) and works by other scholars into the importance of organization in bureaucratic action (Wilson, 1989). The principal theoretical assumption shared within this field is that the aspects of organizational structure, mechanism of control and coordination, and personnel are vital in determining the efficiency and effectiveness in organizational functions and processes. Much of this research has grown out of the need for reform from a sluggish, traditional bureaucratic machine to a new high-performing administrative state (Gulick, 1937; Winter, 1993). The theoretical approach has potential for this analysis as it seeks to explain variations in effective administration of environmental policy. The theories and findings presented in this chapter will inform an analysis of state environmental organization. First, this chapter will proceed with discussions of centralization, formalization, and professionalism, followed by the significance of outputs versus outcomes in defining the "logic of task." Second, an overview of organization in environmental policy will be presented. Finally, the integrated policy outcome model introduced in the previous chapter will be expanded to include organizational components.

Centralization, Formalization, and Professionalism

The impetus for reform at the government has always seemed to focus on the reorganization of institutions. The theorists of the classical era pioneered this approach with Departmentalism and the focus on centralization, formalization, and professionalism. The emphasis on structure remained for practitioners, as it was both a symbolic and attractive approach to reform, even though it faded for academicians (Durning, 1995; Moynihan, 2005; Fry and Raadschelders, 2008). The Winter Commission report was a reintroduction of the same themes (Winter, 1993). As such, centralization, formalization, and professionalism have been repeatedly found to significantly impact the organizations outcomes (Boyne, 2003; Andrews, 2010).

The classical period of public administration consisted of two complementary approaches: Scientific Management and Departmentalism. Both focused on creating a more efficient and effective bureaucracy, a science of administration, and principles of administration derived from that science (Fry and Raadschelders, 2008). The Scientific Management can best be summed up with Frederick Taylor's postulate of the "one best way" to accomplishing any task. Scientific Management was focused primarily on the performance of physical tasks (Nelson, 1980; Fry and Raadschelders, 2008). Departmentalism, on the other hand, is focused on the formal organizational structure, which formed a logical complement to Scientific Management. Departmentalism, though it lost favor along with Scientific Management in light of work from Herbert Simon and Dwight Waldo effectively dispelling the science of administration (Harmon, 1989), has seen a reemergence in the New Public Management era (Fry and Raadschelders, 2008). Modern scholars are re-recognizing the role structure and organization play in creating efficiency in processes, and have begun to analyze these issues with modern methodological tools (Meier and Bohte, 2000). Before looking at contemporary research, the foundations of this theoretical approach should be established.

Departmentalist concentrated their endeavors on the "identification of the tasks necessary to accomplish an organizational objective and the grouping and coordination of those tasks in a way that would maximize organizational efficiency" (Fry and Raadschelders, 2008, p. 4). In this research objective, their most important tool of analysis was the formal organizational chart, with chain of command, span of control, and line and staff serving as key issues. The guiding logic in creating efficiency through organization was that authority should be adequate to manage responsibilities, command should be unified, and respect for the chain of command was essential (Gulick, 1937; Fry and Raadschelders, 2008). Chief among the scholars of public administration during this era was Luther Gulick, affectionately known as the "Dean of Public Administration" (Blumberg, 1981). Gulick's work on organizations, structures, and public administration theory is the embodiment of the Departmentalism approach; thus, his work best establishes the theoretical underpinnings.

Luther Gulick came to prominence in the field of public administration as a both a reformer in the New Deal era and as a scholar forging the emerging academic field (Blumberg, 1981). Gulick placed a "particular stress on structural reform in the name of consolidation and integration, centralization to enhance executive power, professionalization to improve the quality of personnel in the public sector, and the rationalization of decision-making and management processes to assure greater effectiveness and efficiency in service delivery" (Fry and Raadschelders, 2008, p. 86). He viewed the essential problem of management as creating, controlling, and coordinating labor through a division of functions (Denhardt and Baker, 2007).

In order to effectively operate, the expansive administrative state had to incorporate strict definitions of functions and divisions of work, formalized structures and relationships within the bureaucracy, professional staffs, and rational activities (Gulick, 1937; Fry and Raadschelder, 2008). Administration should be integrated under strong executives, and coordinated under a chief executive with a view of the entire process. From Gulick's work, Fry and Raadschelders (2008) distinguished certain principles to guide the efficiency in organization:

1. Related work should be administrated as a unit
2. All agencies should be consolidated into a few department
3. Each unit of administrative work should be placed under a single, responsible official selected on the basis of proven ability, technical knowledge, and experience
4. The power of the department head should be commensurate with his responsibility
5. Each head of a large department should have a staff for performance evaluation

6. Responsibility for each function should be vested in a specific official

7. All administrative work should be headed up under a single chief executive, who should be directly elected by, and responsible to, the voters or their representatives

8. The chief executive should have the power to appoint and discharge department heads and to direct their work

9. The chief executive should have a research staff to report on the work of the departments and search for improved methods of operation (p. 97 – 98)

The work of Luther Gulick is both exhaustive and intricate, being developed over a career that saw public administration emerge as a reform movement into the quasi-fourth branch of government. In sum, Gulick's principles focused on centralizing decision making authority in a single executive, formalizing job roles and responsibilities to limit the constrict the need for decision making by individuals, and professionalization of the workforce to indoctrinate public administrators into the principals of administration. By creating a structure that fit bureaucrats into specified roles and functions with all decisions being coordinated by a single leader, the organization could become efficient and effective in its work.

The recent catalyst for government reform and reorganization were the National Performance Review (NPR) and the Winter Commission Reports driven by the New Public Management movement (NPM). The Winter Commission Report, chaired by former Mississippi Governor William F. Winter and commissioned by the Nelson A. Rockefeller Institute of Government, was the counterpart of the NPR for state and local government. Based on the work of Osborne and Gaebler (1993), the NPM movement sought to make government more efficient and more responsive to citizen needs through a rethinking and reinventing of traditional government structures. NPM emphasizes goals over rules, efficiency in performance, enterprising government, anticipatory approaches, competitive government, empowering citizen, and government steering, not rowing society (Osborne and Gaebler, 1993). The NPM movement is the modern encapsulation of the management techniques pioneered by Gulick and other classical scholars, but empowered by contemporary theory, tools, and experiences. As the driving force behind many state-level reforms in organization in the last two decades, the Winter Commission is particularly important in identifying the central themes of reforms. The Winter Commission, holding hearings across the nation with practitioners, elected officials, and academics, sought to determine strategies for the reform of state and local government, through the theoretical approach of NPM. The first report of the Winter Commission, aptly entitled Hard Truths/Tough Choices, identifies several strategies and recommendations for reform; however, the first three strategies and their respective recommendations are of the most interest here. They are:

1. Remove the barriers to stronger executive leadership
    a. Strengthen executive authority to act by reducing number of independently elected cabinet-level officials
    b. Temper the fragmentation of government by consolidating or eliminating as many overlapping or underperforming units as possible through a "base-closure" approach
    c. Use the executive budget approach and give state and local executive more opportunity to have their program considered as a whole in the legislative process
2. Remove the barriers to lean, responsive government

a. Flatten the bureaucracy by reducing the number of management layers between the top and bottom of agencies and thinning the ranks of the managers who remain

b. Deregulate government by: 1) reforming the civil service, including reduced use of veterans' preferences and seniority; 2) streamlining the procurement process; and 3) making the budgeting process more flexible

3. Remove the barriers to a high performance work force

a. Create a learning government: 1) restoring employee training and education budgets; 2) creating a new skills package for all employees; 3) basing pay increases on skills, not time in position; 4) insisting on a new kind of problem-solving public manager, not merely a paper passer; and 5) encouraging a new style of labor-management communication (Winter, 1993)

The Winter Commission presented many recommendations for reforms for state and local government. While it called for a reinventing and rethinking of government, the message was also very clearly for structural reform of the bureaucracy. The issue with the highest emphasis was centralization. The Commission report called for the centralization of authority in the executive of state, by eliminating independent executives and by better coordinating functions within the executive branch by reducing the fragmentation of the bureaucracy. Ironically, the NPM movement suggested a decentralization of decision-making in which decisions be pushed to the lowest possible level; a principle the Winter Commission did not take into account, though. Additionally, the Winter Commission sought to reduce formalization by removing red tape and civil service elements from the public bureaucracy, and transforming bureaucrats out of traditional tasks oriented approaches and into more goal oriented managers. Finally, the Commission sought to increase professionalism by basing pay on skills, increasing employee training and education, and emphasis skills packages for employees. While they represent two different perspectives, the reforms suggested by the Winter Commission emphasis many of the same issues of Gulick's work. Thus, centralization, formalization, and professionalism seem to be the guiding themes for organization structural reform.

Centralization, formalization, and professionalism are the recurrent themes in organizational reforms (Penning, 1973; Boyne, 2003; Andrews, 2010; Pugh et al 1968). These common principles were described in Weber's ideal bureaucracy type, as well (Weber, 1947). First, a centralized organization is highly dependent on hierarchical authority and an oligarchic decision making process, with lower level employees left out. Conversely, a decentralized organization rebuffs hierarchical control, and infuses decision making authority at multiple organization levels (Weber, 1947; Andrews, 2010). Centralization has long been seen as a critical research area for organizational theoriest (Pugh et al, 1968). Centralization is a key indicator of the organizational decision making process, and the mechanisms of prioritization and resource allocation (Andrews, 2010).

Second, formalization is the degree to which job responsibilities and organizational rules are strictly adhered to or formalized (Weber, 1947; Andrews, 2010). Some organizations find a need to enforce a strict structure of jobs and rules, while others find it applicable to have a less formal structure with more fluid job roles (Orsburn and Moran, 2000). In brief, the need for formalization comes from the information asymmetries described in principal-agent theory. Agents tend to have more information than their principals, which enables them to seek their own interest rather than that of the principal. By formalizing roles and rules, the principal gains more control over outputs and reduces the opportunity of agents to seek their own interests in hindrance of the organization. However, formalization does handicap motivated, innovative employees from working outside of the rules and achieving greater organizational gains (Brehm and Gates, 1999; Andrews, 2010). Andrews (2010) contends "the impact of formalization on performance is likely to have complex and possibly contradictory effects for several reasons" (p. 95 – 96).

Finally, professionalism is the degree in which organizational members participate in professional networking activity or training "to extend their expertise within their individual areas of specialization" (Andrews, 2010, p. 96). Professionalism creates an organization with a better trained and skilled workforce capable of producing better services through advanced training. Professionalism may also create an incentive for organizational members to further develop their skills or maintain an acceptable level of performance or ethical standards. Mosher (1982) identifies the emergence of the professional core as an era of public human resources management as it plays an important role in defining the job responsibilities, ethics, and standards of modern bureaucrats in professional fields. However, professionalism within an organization may create a dependence on established solutions to conventional problems or incremental responses to new problems, which will handicap the organizations ability to react to emerging issues (Mintzberg, 1979). Professionalism is likely to improve performance in traditional organizational functions, but may diminish performance in emerging challenges or those that transcend professional specialties.

In studying centralization, formalization, and professionalization in organizational structure, the survey instrument used by Hage and Aiken (1967) has proven to be both a popular (Andrews, et al 2009; Martin and Segal, 1977; Moynihan and Pandey, 2005; Richardson et al, 2002; Schmid, 2002; Penning, 1973) and useful tool (Pennings, 1973; Andrews, 2010). Pennings (1973) analyzed the research designs for organizational structure studies and proved the validity of the Hage and Aiken (1967) research design in comparison to the alternative of interviewing top-officials and document analysis used by Pugh et al (1968) and Inkson, Pugh, and Hickson (1970). However, the Hage and Aiken (1967) approach has been more widely applied since as a research tool (Andrews, 2010). Hage and Aiken (1967) surveyed 16 social welfare and health agencies using measures of centralization, formalization, and organizational complexity. There measures are aimed at capturing the internal dynamics of organizations, and designed as organizational level surveys. Centralization was measured by participation in decision making and the degree of hierarchy of authority. Formalization was measured with how many rules define job positions, and whether the rules were enforced. Finally, organizational complexity was measured as the number of occupational specialties, and professional activities and training. The Hage and Aiken (1967) survey tool is well regarded in the field as a means to capture the internal structure of organizations.

Centralization and formalization have been used as variables for predicting organizational outcomes in numerous studies (Boyne, 2003). In applying Gulick's research design and organizational principles, Meier and Bohte (2000; 2003), in two separate studies, found span of control, as an aspect of centralization, significantly shape policy outcomes. Additionally, Glisson and Martin (1980) argue a centralized, hierarchical management structure is the most important predictor for productivity and efficiency, and Wolf (1993) finds it is equally as important in predicting policy outcomes.

Findings for the effects of formalization on policy outcomes are less consistent, however. A positive relationship has been found between the degree of formalization and productivity (Molnar and Rogers, 1976; Anderson, 1995) the quantity of outputs (Whetten, 1978), innovation (Anderson, 1995), and responsiveness (Schmid, 2002). On the other hand, some studies have failed to find significant results when testing for the impact on efficiency (Glisson and Martin, 1980) and policy outcomes (Lan and Rainey, 1992; Wolf, 1993). On the other hand, the role of professionalism has been widely researched, but few studies have included professionalism as a factor in effecting organizational outcomes (Andrews, 2010). However, Boreham, Shea, and Macway-Jones (2000) find the reliance on professional authority alone can lead to serious hospitals, as decision making is limited by the professional specialty. Centralization, formalization, and professionalism are key organizational features that have potential to explain performance outcomes. Centralization, formalization, and professionalism are recurring themes in organizational structure. From Gulick to Winter, these aspects of structure have been emphasized for reform and restructuring to curtail or expand decision making in the organization. Contemporary researchers have recognized the importance of these variables in organizational performance.

The Logic of Task

James Q. Wilson's Bureaucracy (1989) is one of the most notable studies of organization in public agency. The central argument of Wilson's work is that "organization matters, even in government agencies. The key difference between more and less successful bureaucracies… has less to do with finances, client populations, or legal arrangements than with organizational systems" (p. 23). The effort of his work is to describe the essential features that effect bureaucratic decision-making. Wilson's analysis is both complex and intricate as he investigates how rank-and-file bureaucrats, managers, and executives decide what to do. Wilson introduces numerous subjective concepts describing the motives of bureaucratic actions (i.e., culture, beliefs), many of which rely principally on the perceptions of the individual bureaucrats of their situation. However, the piercing concept that Wilson identifies as guiding organizational management is the relationship between tasks and goals. More importantly, as whether the work of public agencies and the bureaucrats working within specific agencies view the work as completing tasks, achieving goals, or a combination of the two.

The relationship between tasks and goals are important distinction in defining decision-making. Wilson articulates the implications of the definition of tasks and goals as:

> "When tasks can be inferred freely and unambiguously from the stated goals of a government agency, they can be defined by the agency's executive and, given proper leadership, can become the basis of a strong organizational culture…When goals are relatively unambiguous but the agency lacks the political freedom to convert those goals into tasks, the formation of a suitable culture becomes much harder…When the goals are too vague or ambiguous to permit them to become a ready basis of task definition, the tasks often will be shaped not by executive preferences but by the incentives valued by the operators" (p. 49).

It is the "logic of task" that shapes organizational management; that is to say the guiding logic that defines the tasks of operators (street-level bureaucrats), managers, and executives molds their decision-making and behavior within the organization (Moore, 1992).

Wilson identifies two components within the logic of tasks as: outputs, the actually work the agency does; and outcomes, the effect of the agency work on the world. Outputs represent the day-to-day activities and labors of operators. Outcomes represent the goals of the organization. The outputs of a police department would be enforcing laws, arresting offenders, and the like; the outcomes, would be safer communities. Sometime these elements are observable and other times they are not. The capacity, or lack thereof, is an important factor in driving management and the structuring of the tasks of operators. Wilson identifies four types of agencies based on outputs (tasks) and outcomes (goals): production, procedural, craft, and coping. Table 4.1 presents a matrix of agency typology.

Table 4.1

Wilson's Agency Typology

		Outputs	
		Observed	Non-Observed

Outcomes	Observed	*Production Organization*
		• Both outputs and outcomes are observable
		• Examples:
		  • Internal Revenue Service
		  • Social Security Administration
			Craft Organization
			• Outputs are hard to observe, but outcomes are relatively easy to evaluate
			• Examples:
			  • Armed Forces, during wartime

	Non-Obsered	*Procedural Organization*
		• Outputs by operators are observable, but the outcomes of the work are not observable
		• Examples:
		  • Armed Forces, during peacetime
			Coping Organization
			• Neither outputs nor outcomes are observable
			• Examples:
			  • Schools
			  • Police Departments

Source: Wilson (1989)

Production organizations are where outputs and outcomes are observable. There are several public organizations that fit into this type, including Internal Revenue Service and Social Security Administration. Managers at the IRS are able to account for the day-to-day activities of their auditors and account for the national tax revenue. In this context, managers can design a system of compliance to produce efficient results for the organization. The ability to observe both outputs and outcomes simplifies the managerial role; however, "the existence of conditions conducive to production-oriented management does not guarantee that such management will occur" (Wilson, 1989, p. 160). Of course, there is the central tendency for managers and operators to focus organizational resources and attention on outcomes or outputs that are most easily measured at the detriment to those that are more difficult to measure. According to Wilson (1989), "there is a kind of Gresham's Law at work in many government bureaus: Work that produces measurable outcomes tends to drive out work that produces un-measurable outcomes" (p. 161). Operators within this context are aware of the method of judgment of their job performance and will, thus, attempt to alter numbers in a desire to avoid work or engage in other work activities. Furthermore, some organizations make the mistake by narrowly defining outcomes, so that not all desired outcomes are observed.

Procedural organizations are where outputs can be observed, but the outcomes of that work are not observable. Procedural organizations must rely heavily on professionalism as the guiding force for operator behavior. The most notable procedural organization is the Armed Forces during peacetime, when the day-to-day activities in training and such can be observed but the results of that training cannot be judged. By relying on professional standards of practitioners, operators are under a professional and ethical obligation to seek the client's and/or organizations interest above their personal interest. When the outcomes of actions cannot be easily determined, it is not prudent for operators to be allowed to exercise discretion in their job; there is no way to conclude what results that discretion may lead to. Procedural organizations are means-oriented organizations; "how the operators go about their job is more important than whether doing those jobs produces the desired outcomes" (Wilson, 1989, p. 164). The focus on means creates the rise of the Standard Operating Procedures (SOPs) as the governing document of operator activities, reducing the risk of both operators and managers in decision-making.

Craft organizations are where outputs are difficult to observe, but outcomes are easy to observe. In contrast to the procedural organization, craft organizations are goal-oriented. The most pronounced example of a craft organization is the Armed Forces during wartime, in which the work products of soldiers in the field are difficult to observe, but the outcomes of battles are easy to determine. Management relies heavily on sense of duty of the operators to the goals the organization is attempting to accomplish. Behavior is constrained by indoctrinated skills and group pressure to conform to certain norms. Operators are allowed considerable discretion in undertaking job activities under the auspice they will lead the organization closer to its goals. Managers must trust their subordinates to understand and work towards goals. However, organizations are not often satisfied with simply judging employees by goals. Managers have to attempt to both develop good work skills, but also a sense of commitment to good work behavior.

Finally, coping organizations are where neither outputs nor outcomes can be observed. Examples of coping organizations are public schools or police departments. For a principal at public school, it is almost impossible to judge what teachers are good or bad, or to determine the outcome of their teaching. The only option of managers is to attempt to cope with the situation by any means they judge to be appropriate. Since there is no objective, readily observed measures for what the work of employees at these organizations should be accomplishing, managing and coordinating their efforts is no easy task. Managers have to recruit employees, encourage or discourage their efforts, and cultivate an atmosphere for good work, when they have no reliable information on who the best employees are, what efforts are good or bad, or what good work atmosphere is. The consequence is conflict between managers and operators working in an uncertain environment in which they cannot determine what behavior or outcomes are or how they are interrelated: "The operators will be driven by the situational imperatives they face…The managers will be driven by the constraints they face, especially the need to cope with complaints from politically influential constituents" (Wilson, 1989, p. 169). Thus, behavior of individuals within coping organizations is much more difficult to predict. To mitigate the difficulties of the environment, managers will seek out easily measured outputs and judge their operators based on those, as well as limit the discretion of their subordinates. On the other hand, operators will simply work towards whatever measure they are being judged on, or will do whatever is necessary to get by as they seek their own work goals.

Wilson's typology is useful in marking the distinctions between public organizations of dissimilar functions, roles, and responsibilities (i.e., why the IRS and public schools are different). However, less obvious is its usefulness in marking the distinctions between public organizations of supposedly similar functions, roles, and responsibilities. Wilson instigates this notion. He identifies the Federal Bureau of Investigation as a production organization, the Antitrust Division of the Department of Justice as a craft organization, and police departments as coping organizations. Although these organizations are clearly all law enforcement agencies with many of the same functions, they fall into different categories because of the unique place they hold within the law enforcement system. Additionally, he identifies the Armed Forces during peacetime as a procedural organization and the Armed Forces during wartime as a craft organization. The guiding logic of an organization changes with the context. Basically, it is not necessarily the functions, roles, or responsibilities within government that define the type of organization, but the logic of task which is heavily depend on the perceptions of organizational leaders.

Furthermore, as Wilson notes, managers tend to be guided toward observing certain outputs or outcomes based on the ease of doing so. Environmental protection makes an interesting example of potential dissimilarities. Environmental outcomes are the ultimate goal of federal environmental laws, but they also include provision for outputs. Environmental outcomes are not easily determined, measured, or agreed upon (see Chapter 2). Environmental outcomes would be the reduction of pollutant concentrations in air and water, while environmental outputs would the issuance of permits, the enforcement of regulations, or the awarding of grants. Outputs are the series of daily work activities that taken together result in outcomes.

There are a plethora of indicators based on different hazardous substances, levels of concentrations, and methods of data collection. Much of this is outlined in the implementation plans for legislation such as the CAA and CWA, but it can vary widely by state. Therefore, two environmental managers in different states can have different approaches to the observation of outcomes. Additionally, the tasks outlined in the legislation for managers can vary. Under the CAA, managers in attainment areas have a different SIP, than those in nonattainment areas. The tasks of environmental managers may not be the same across jurisdictions, due to different implementation plans. Moreover, the case of the National Environmental Policy Act (NEPA) of 1969 is notable as well. Under NEPA, all federal agencies are required to complete an assessment of the potential environmental impact of agency actions. The provisions of NEPA are the responsibility of all federal agencies and not just EPA; therefore, there are all four types of agencies undertaking the same functions. There are two interesting findings relative here. First, agencies have developed their own approaches to implement NEPA based on their understanding of the law (Wichelman, 1976). Second, "organizational characteristics and political pressures were of major significant in determining the magnitude, speed, and character of the agencies responses" (Andrews, 1976, p. 301). Therefore, even within essentially the same legislative responsibilities, agencies are functioning differently due to their perceptions of their tasks. Thus, it can be deduced that environmental managers implementing the same legislation are likely to see different results based on their perceptions of the situation.

However, in reality goals and tasks are not as easily defined or captured. Bureaucrats work in an environment with conflicting directives and numerous masters

(Brehm and Gates, 1999). Goals define the purpose of the organization, help to shape decision-making guidelines, and serve as a means for evaluation (Campbell and Nash, 1992; Scott, 2003; Chun and Rainey, 2005). As goals are the driving force behind organizational decisions, a lack thereof can lead to dysfunction. For many public organizations, there are multiple, unclear goals. The multi-dimensions of tasks, roles, and responsibilities complicating matters, and dilutes the effectiveness of incentives for worker performance (Dixit, 2002). If workers are not certain as to what their goals are, they have no legitimate basis for decision-making. With conflicting or competing goals or tasks, operators and managers will be forced into an uncertain decision-making atmosphere. In an environment of conflicting directions, goals tend to become ambiguous leading to further difficulty.

Chun and Rainey (2005) identify "organizational goal ambiguity as the extent to which an organizational goal or set of goals allows leeway for interpretation, when the organizational goal represents the desired future state of the organization" (p. 2). Goal ambiguity can result from organizational mission, managerial directives, the evaluative criteria, and organizational priorities (Chun and Rainey, 2005; Chun and Rainey, 2005). Of course, organizational priorities are directly related to combating conflicting goals. Chun and Rainey (2005) attempt to measure organizational goals through assessment of the mission statement, the magnitude of agency rules and governing legislation, the organizations evaluative criteria, and the use of strategic goals and performance targets. Ambiguity and conflicts in goals are detrimental to organizational performance at multiple levels, as tasks cannot be managed to achieve the desirable end (Rizzo, House, and Lirtzman, 1970; Chun and Rainey, 2005; Chun and Rainey, 2005). In other words, without clear goals, the organization and its components have little or no idea what the outcomes or outputs of their action should aggregate to, removing meaning and purpose from the work. Therefore, well-defined goals are a significant part of the logic task and decision-making within the organization.

The framework proposed by Wilson (1989) classifying organizations is an effective and useful method for identifying a significant organizational aspect. Studies have used Wilson (1989) for both the classification of public organization (Tang, Robertson, and Lane, 1996; Roness, 2003; Roness, 2007) and performance measures (Lonti and Gregory, 2007; Brehm, Gates, and Gomez, 2003). The outputs versus outcomes approach is an effective way to differentiate between organizations doing substantially similar work, but are operating in inconsistent ways. The logic of task is a structural component that is vital in defining how bureaucrats are functioning within the organization.

Institutions in Environmental Policy

The states have developed a variety of structures to govern environmental policy within their jurisdictions. Ringquist (1993b) sums up the role of institutions and management in environmental efforts: "With states taking over a significant amount of responsibility for environmental programs, as well as numerous other policy areas, an important question arises over the ability and competence of the states to administer these programs" (p. 63). States have designed structures to coordinate their environmental policy efforts (Bacot and Dawes, 1997). The most common form of state environmental protection organization is a single, "mini-EPA" type agency, in which the primary focus is on environmental quality or protection. However, this setup is only present in 20 states. The other 30 states have adapted multi-purpose agencies (e.g., Kansas Department of Health and Environment), multiple agencies with environmental policy administrative responsibilities (e.g., Alabama Department of Environment Management and Department of Conservation and Natural Resources), or agencies with mission that do not focus principally on environmental management (e.g., Washington Department of Transportation). The variety of state environmental agencies draws attention to the importance of organizational structures. (EPA, "State Environmental Agencies)

In descriptive terms, these structures vary widely across the nation. Previous research has made the biggest distinction in a dichotomy between the "mini-EPA" structure and all others (Goggin et al, 1990; Bacot and Dawes, 1997; Breaux et al, 2010). Goggin et al (1990) contends the "mini-EPA" structure is most capable of creating consistency and managing the responsibilities of implementing federal environmental policy.

Table 4.2 presents state environmental agencies by purpose. The most popular agency purpose is for the singular mission of environmental quality and protection (a mini-EPA type agency), which are present in 35 states. Agencies dedicated to natural resources and conservation are present in 17 states. To distinguish the two approaches, protection efforts are designed to prevent or remediate damage to the environment, while conservation efforts are designed to see natural resources are used properly (Cubbage, O'Laughlin, and Bullock, 1993). While it seems like a minor difference, it does suggest a different approach to the same activity.

Table 4.2

Organization of State Environmental Agencies by Purpose

Environmental Quality & Protection			
Alabama	Illinois	Montana	Oregon
Alaska	Indiana	Nebraska	Pennsylvania
Arkansas	Kentucky	Nevada	Texas
Arizona	Louisiana	New Hampshire	Utah
California	Maine	New Jersey	Vermont
Connecticut	Maryland	New Mexico	Virginia
Florida	Massachusetts	New York	West Virginia
Georgia	Michigan	Ohio	Wyoming
Idaho	Mississippi	Oklahoma	

Natural Resources & Conservation		Niche Purposes	
Alabama	Missouri	Arizona	Minnesota
California	Nevada	Delaware	Oregon
Georgia	Ohio	Illinois	Ohio
Hawaii	Oklahoma	Nevada	Idaho
Illinois	Pennsylvania	North Carolina	Washington
Indiana	South Carolina	North Dakota	
Iowa	Vermont		
Kentucky	Washington		
Maryland	Wisconsin		
Minnesota			

Health		Multi-Purpose	
Colorado	North Dakota	Delaware	Tennessee
Hawaii	South Carolina	North Carolina	Washington
Kansas		South Dakota	

Source: EPA, "State Environmental Agencies," http://www.epa.gov/epahome/state.htm
Note: Some states have multiple agencies falling into more than one category. Agencies within the same category do not necessarily have the same designations.

Niche agencies have also been created in 11 states with very limited purposes within environmental policy, such as the California Air Resources Board or the Minnesota Pollution Control Agency. A minority of states have adopted public health agencies or agencies with multiple purposes for the management of environmental policy. Five states have placed at least some aspect of environmental management under a public health agency. The multiple purpose agencies are present in five states, which typically include a combination of the other agency purposes. (EPA “State Environmental Agencies)

In addition to varying agency purposes, the centralization of environmental policy management varies across states as well. Lester (1995) argues centralization of the environmental bureaucracy helps “to eliminate jurisdictional overlaps, jealousies, and conflicts among multiple agencies in this area” (p. 52). Table 4.3 presents state environmental organization by the number of agencies.

Table 4.3

Organization of State Environmental Agencies by Number of Agencies by State

One		
Alaska	Massachusetts	North Dakota
Arkansas	Michigan	Rhode Island
Colorado	Mississippi	South Dakota
Connecticut	Montana	Tennessee
Delaware	Nebraska	Texas
Florida	Nevada	Utah
Georgia	New Hampshire	Virginia
Iowa	New Jersey	Vermont
Kansas	New Mexico	West Virginia
Louisiana	New York	Wisconsin
Maine	North Carolina	Wyoming
Two		**Three**
Alabama	Missouri	Illinois
Arizona	Oklahoma	Kentucky
Hawaii	Oregon	Ohio
Idaho	Pennsylvania	
Indiana	South Carolina	**Six**
Maryland	Washington	California
Minnesota		

Source: EPA, “State Environmental Agencies,” http://www.epa.gov/epahome/state.htm

The single agency structure is by far the most popular, with 33 states choosing this approach. However, some of these states have created multiple organizations nested within departments to deal with the varying aspects of environmental protection. Far fewer states have adopted multiple independent agencies to manage environmental concerns: 13 states have two agencies and five states, three agencies. Worth note is California, which has adopted six different organizations for environmental management including three departments, a mini-EPA agency, and two independent boards. In some states there are centralized implementation efforts, while in others multiple agencies are responsible for the same efforts (EPA, "State Environmental Agencies"). Nevertheless, most states have vested authority over air and water quality into single agencies. Notable exceptions for air quality are California, Illinois, Kentucky, and Ohio; and for water quality, California, Idaho, Illinois, and Kentucky. While there may not be competition over efforts specific to air and water quality in the overwhelming majority of states, there remains competition on the agenda for specific environmental concerns. The superficial elements of the organization of state environmental efforts indicate states are developing individual mechanisms and approaches for managing the same policy responsibilities.

The capability of states depends significantly on both the government institutions and the managerial capacity, which creates an institutional capacity (Warren, 1982; Ringquist, 1993b). The capacity of an organization is the product of structure, personnel, and financial resources (Goggin et al, 1990). Organizational or institutional capacity has been utilized in several studies of environmental efforts (Goggin, et al, 1990; Lester, 1994; Cline, 2003; Travis, Morris, and Morris, 2004; Breaux et al, 2010). Lester (1994) is the most notable to recognize the importance of institutional capacity for implementing complex federal programs. States with the greatest capacity are expected to be the most effective in environmental protection efforts, with factors such as political institutions and centralization in bureaucracy explaining variation in implementation (Lester, 1994). Lester (1994) creates a capacity/commitment model which relies on Bowman and Kearney (1988)'s instrument; an instrument which has been utilized by others as well (Travis, Morris, and Morris, 2004; Breaux et al, 2010). Bowman and Kearney (1988) define capacity as: "1) to respond effectively to change; 2) to make decisions efficiently, effectively (i.e., rationally) and responsively; and 3) to manage conflict" (p. 343). In capturing the concept of capacity, Bowman and Kearney (1988) create a pool of 32 variables arranged into four factor variables: staffing and spending, accountability and information management, executive centralization, and representation. Other authors have used staffing levels (Sapat, 2004; Shapiro, 2005) and spending (Lester, et al, 1983; Shapiro, 2005; Stafford, 2006; Abel, Stephan, and Kraft, 2007; Woods, Konisky, and Bowman, 2009) as a means of capturing this concept. Of course, measurement is a critical element for any analysis, especially with abstract concepts such as organizational factors. Attempts to capture these concepts must be able to differentiate between characteristics in a meaningful way, and should be developed with a direct relationship to theory. Institutional capacity plays into the ability of institutions to rationally, effectively, and efficiently carry out their responsibilities in implementing policy.

Institutions and organization in state environmental agencies is not a new concept to consider in policy outcomes. Several studies have included capacity, centralization, and mission in predicting environmental policy outcomes at the state level. With the diversity of missions and centralization of functions across states, organization is clearly an element that warrants inquiry. A minority of states operate the same organization for their environmental agencies, with several being completely unique. Furthermore, no states are equal in institutional capacity. The result is environmental policy is being implemented within vary organizational contexts, which effect the outcomes.

Conclusion

In the era of Scientific Management, Departmentalists were the first to focus on the organizational structure as the key to more efficient and effective administration. The key assumptions were that centralized decision making, formalization of job roles, and professionalism among bureaucrats would create a structure for bureaucrat actions that would lead to the most efficient and/or effective organizational outcomes (Fry and Raadschelders, 2008). Interest in this theoretical approach died along with Scientific Management in the middle of the 21st century, but in 2000s new scholars recognized its applicability in modern management. Contemporary research has reaffirmed the significance of centralization, formalization, and professionalism in effecting organizational and policy outcomes (Andrews, 2010).

The most significant modern guidelines for reform of state government were set forth in the Winter Commission first report in 1993. Although empowered by NPM rather than traditional public management theory, the structural reforms suggested focused on the same principles of centralization, formalization, and professionalism (Winter, 1993). The Winter Commission report has been the driving force behind reforms in many states (Nigro and Kellough, 2008). The report suggests a centralization of executive power, reduction in the formalization in task-oriented roles, and an increase in professionalism in the workforce are necessary reforms for the states (Winter, 1993). Reorganizational efforts have been the preference of reformers over rethinking or reinventing efforts (Durning, 1995). The organizational structure of state governments has been the focus of much time and effort by practitioners, but has not received nearly as much attention by contemporary scholars. The diversity of organizational structures, however, does warrant attention to this particular element of state government.

James Q. Wilson suggests a different mechanism for evaluating organizations. He contends that agencies are best differentiated by the observation and priority of goals and/or tasks, or lack thereof. Creating an agency typology, Wilson identifies agencies as functioning differently based on their perception of these elements (Wilson, 1989). Thus, there is a "logic of task" that is foundational in organizations which defines how they will operate. The "logic of task" can vary between agencies with the same roles, responsibilities, and functions (Moore, 1992). As an element of organization, it effects how bureaucrats will approach their actions, and, ultimately, the outcome of the collective action.

Some enterprising environmental researchers have begun to recognize the role of institutions and organizations in effecting policy outcomes (Goggin et al, 1990; Ringquist, 1993b; Lester, 1994; Bacot and Dawes, 1997; Cline, 2003; Travis, Morris, and Morris, 2004; Breaux et al, 2010). Nevertheless, studies including this concept as a variable, in one form or another, are far from the norm. Scholars have preferred to focus on political or economic variables to explain differences in environmental outcomes (see Chapter 3). The research that has included organizational variables, though, has been promising in expanding the understanding of policy outcomes. Based on theory and evidence, the diversity in organizational setups of environmental agencies by state governments should not be overlooked.

In the previous chapter, the role of state politics was discussed at length for its implications in creating the context in which environmental policy implementation was occurring. However, state politics only represents a broad generalization about the environment in which implementation occurs. The organizational structure in which implementation occurs is another element of the context of implementation. An analogy will clarify the point: Student A attends Mississippi State University as a Political Science major, and Student B attends the University of Mississippi as a Political Science major. While their education is occurring within the same general political and economic context, the organizations responsible for educating the students are much different. Thus, their educational experiences will be different (clearly, the MSU student will be better educated). State politics alone cannot explain why Agency 1 in State X is successful in job, but Agency 2 in State X is profoundly unsuccessful. A more detailed look at those agencies can answer that question though. The context of implementation is imperative in predicting its outcomes. The next chapter will delve into implementation. Including both the broad and specific contexts, implementation can be better used to explain differences in policy outcomes.

CHAPTER 5

IMPLEMENTATION AND POLICY OUTCOMES

The intent of this chapter is to present a review of research focused on the implementation of public policy. A review of the existing findings of implementation research provides both a background for the analysis of the implementation process and insight into potential factors effecting outcomes. Research into policy implementation did not find a foothold until questions of the massive new social programs of the Great Society era began to coming to forefront of public policy (O'Toole, 2000). Interest in the effects of implementation on policy outcomes have not dissipated since (Lester et al, 1987; O'Toole, 2000; deLeon and deLeon, 2002). The principal theoretical assumption shared by scholars in this area is that the implementation stage of the policy process has a pronounced effect on the outcomes of policy. Much of the theoretical research has been focused around two competing approaches: top-down and bottom-up perspectives. The former places emphasis on the centralized structures in controlling the process, while the latter contends bureaucrats have significant discretion in their positions resulting in a decentralized decision-making structure. There have been several notable attempts to either combine both approaches into a single model or to determine under which conditions one approach is more effective. However, there is no single accepted theoretical framework for analyzing the implementation process (Lester et al, 1987;

O'Toole, 2000; deLeon and deLeon, 2002). The theories and findings presented in this chapter will inform an analysis of the implementation of environmental policy. First, this chapter will proceed with discussion of the evolution of the field of implementation. Second, an overview of the debate between the top-down and bottom-up approaches will be presented. Third, several significant attempts to reconcile the two approaches will be discussed. Fourth, implementation research specific to environmental policy will be introduced to determine the applicability of these models to the policy area of interest here. Finally, the integrated policy outcome model introduced in previous chapters will be expanded to include implementation components.

The Study of Implementation

Several manifestations of the stages of the public policy process have been postulated. Jones (1984) suggests a four part model (agenda setting, formulation, implementation, evaluation); Dye (2008), a five part model (problem identification, formulation, legitimization, implementation, evaluation); and Kraft and Furlong (2007), a six part model (problem definition and agenda setting, formulation, legitimacy, implementation, evaluation, change). Other scholars have suggested a more dynamic conceptualization of the policy process less reliant on definitive stages and more concerned with the interactive forces effecting policy outcomes (Sabatier and Jenkins-Smith, 1993; Kingdon, 1995; Exworthy and Powell, 2004). While the models of the policy process differ, they all identify implementation as an independent stage. Furthermore, several definitions of the implementation have been advanced. Hargrove (1975) identifies implementation as the stage in which good intentions are transformed into good policy; a sentiment echoed in Ferman (1990). O'Toole (2000) presents a more articulate definition: "policy implementation is what develops between the establishment of an apparent intention on the part of government to do something or to stop doing something, and the ultimate impact in the world of action" (p. 266). Though there is not complete consensus on implementation by scholars (O'Toole, 2000), two things can be agreed upon: 1) it is a standalone component of the policy process; and 2) it is the component that translates ideas into actions.

Initially, scholars made one of two assumptions about implementation: it was either too easy or too difficult to study (deLeon and deLeon, 2002). Scholars either believed "once a policy has been made by a government, the policy will be implemented and the desired results of the policy will be near those expected by the policy makers" (Smith, 1973, p. 197 – 198); or, the issues of implementations were so "overwhelmingly complex" that scholars lacked the methodological sophistication to perform any meaningful analysis (Van Meter and Van Horn, 1975, p. 450 – 451). Both of these assumptions were dispelled by the first major research venture into policy implementation chronicled in Pressman and Wildavsky (1973). Aptly subtitled (in part), Why It's Amazing that Federal Programs Work at All, Pressman and Wildavsky (1973) describe and analyze the implementation an economic development project through the Economic Development Agency in Oakland in the late 1960's. The project which was designed by politicians in Washington was implemented by bureaucrats in Oakland, and was ultimately pronounced a failure. Pressman and Wildavsky (1973) credited multiple goals, multiple stakeholder, vague statutory instructions, and bureaucrat competition to among the chief causes of the policy failure. The long-lasting contribution, however, was the thesis: “implementation should not be divorced from policy” (Pressman and Wildavsky, 1973, p. 143). Pressman and Wildavsky (1973) was a watershed work in public policy research, starting a wave of research projects into the role implementation plays in effecting policy outcomes. In the aftermath of Pressman and Wildavsky (1973), implementation was awarded a much more pronounced role in the policy process by scholars (Jones, 1984; Kraft and Furlong, 2007; Dye, 2008).

First generation studies were rather simplistic. Research attempted to detail accounts of how implementation was carried out through case studies, with a focus on the barriers to effective implementation (Lester et al, 1987; Linder and Peters, 1987). The first generation, during the early 1970’s, was the era of case studies (Lester et al, 1987). With little research available and scholars only just beginning to develop an interest, initial studies consisted of nothing more than accounts of decisions being carried out (Derthick, 1970; Derthick, 1972; Pressman and Wildavsky, 1973; Yin, 1982; Goggin, 1986; Lester et al, 1987). The conclusions produced negative perceptions and an outlook of failure for public programs (Derthick, 1972; Pressman and Wildasky, 1973; Murphy, 1973; Bardach, 1977; Lester et al, 1987). Furthermore, research lacked models to explain either the failures in the implementation process or to account for intervening variables (Goggin, 1986; Lester et al, 1987; Linders and Peters, 1987). While first generation studies were neither methodologically nor theoretically sophisticated, they approached implementation as a decisive step in public policy, forging the linchpin between the ideas of politicians and the outcomes for citizens. However, sophistication would need to be added to implementation research to develop a better understanding of its role in the policy process.

Second generation research attempted to add theoretical sophistication to the study of implementation. Van Meter and Van Horn (1975) contends:

> "At present we know relatively little about the process of policy implementation… While these studies have been highly informative, their contributions have been limited by the absence of a theoretical perspective. To date, no one has advanced a theoretical framework within which policy implementation can be examined" (p. 449 – 451).

Additionally, second generation researchers attempted to bring an empiricist's perspective to policy implementation with an eye towards making implementation more successful by informing practice through theory (Lester et al, 1987; O'Toole, 2000; deLeon and deLeon, 2002). The first step in doing so was the development of policy implementation frameworks, designed to identify factors effecting policy objectives. These frameworks arose in two varieties: top-down and bottom-up (Lester et al, 1987; O'Toole, 2000).

Top-down models assumed a centralization of decision making at the top of the organization (Van Meter and Van Horn, 1975; Nakamura and Smallwood, 1980; Mazmanian and Sabatier, 1981), while bottom-up models assumed significant discretion held by street-level bureaucrats (Berman, 1978; Lipsky, 1978; Hjern, 1982; Hjern and Hull, 1985; Hull and Hjern, 1987). Top-down models included variables such as: economic, social, and political conditions (Van Meter and Van Horn, 1975; Sabatier and Mazmanian, 1980); resources (Van Meter and Van Horn, 1975; Edwards, 1980; Sabatier and Mazmanian, 1980); organizational characteristics (Van Meter and Van Horn, 1975; Edwards, 1980; Sabatier and Mazmanian, 1980); intergovernmental relations and communication (Van Meter and Van Horn, 1975; Edwards, 1980); rules and objectives (Van Meter and Van Horn, 1975; Sabatier and Mazmanian, 1980); the dispositions of implementers towards implementation (Van Meter and Van Horn, 1975; Edwards, 1980; Sabatier and Mazmanian, 1980); and the requisite change the policy entailed (Sabatier and Mazmanian, 1980). On the other hand, bottom-up models focused on the goals, strategies, activities, and networks of front-line operators (Lipsky, 1978; Hjern, 1982; Hjern and Hull, 1985; Lester et al, 1987). Work during this era significantly expanded theory by proposing new hypotheses about the practice of implementation (Van Meter and Van Horn, 1975; Berman, 1980; Nakamura and Smallwood, 1980; Hjern, 1982; Mazmanian and Sabatier, 1981; 1983; Hjern and Hull, 1985; Hull and Hjern, 1987). However, these new empirical models suffered from subjectivity, a lack of parsimony, and imprecision (Meier and McFarlane, 1995; Matland, 1995; deLeon, 1999; Meier, 1999).

Scholars proceeded to widely apply these implementation models testing their ability to link theory with practice (Lester et al, 1987). Van Horn (1987) synthesizes four lessons from these models. First, frameworks were applicable to explaining success and failure of policies, and continue to be accepted by scholars, even though they were subject to criticism. Second, time frame directly affected the research findings in many of these studies, suggesting that time is a crucial element when considering implementation. Third, studies began to focus on successfully implemented programs, rather than just policy failures as those from the first generation, which resulted in a more optimistic outlook for both the practice and study of policy implementation. Finally, it seems the most important lesson is that any program can fail, regardless of simplicity. Following the application of these frameworks to the practice of implementation, scholars began to synthesize and revise the frameworks in hopes of refining theory (Lester et al, 1987). Attempts at revisions resulted in both criticisms of the extant second generation models (Matland, 1995), and attempts to combine the approaches most notably by Elmore (1985), Sabatier (1986), and Goggin et al (1987).

Though its development has been lackluster, a third generation of policy research and theory has been proposed. As suggested by Goggin et al (1990), the third generation should become more scientific and attempt to explain implementation across time, policies, and agencies while predicting future behavior. While Goggin et al (1990) made a major push for this new generation by suggesting several testable hypotheses, most proved to be too ambiguous to be useful, leading to a sluggish start to third generation scholarship. O'Toole (2000) contends "a so-called third general approach to implementation research has been suggested, but relatively little such research has been stimulated by this call" (p. 268). However, others attempted to fulfill the aspiration of the third generation by developing contingency theories as a means to adapt theory to the complexity inherent in implementation studies. Rather than suggest a single general theory with a one size fits all approach, implementation strategies were contended to vary with contextual conditions (Ingram, 1990; Matland, 1995; Scheberle, 1997; deLeon and deLeon, 2002). In essence, "there is no single best implementation strategy,…the appropriate strategy is very much contextual in terms of what are the contingencies surrounding the policy issues and how they can best be addressed in terms of implementation" (deLeon and deLeon, 2002, p. 471).

The scholarly debates over implementation are far from a consensus or parsimonious explanations for the implementation process (O'Toole, 2000; deLeon and deLeon, 2002). It appears that the development of implementation theory has reached a standstill, as research projects continue down this avenue but fail to provide conceptual clarity or theoretical precision (Ingram, 1990; Garrett, 1993; Matland, 1995; deLeon 1999; deLeon and deLeon, 2002). DeLeon (1999) contends a consensual theory of implementation is obviously lacking from the field. Furthermore, while a great deal of work on implementation has been completed, it is not been universally labeled as such leading to a difficulties in identifying the boundaries of the study of implementation (Lester and Goggin, 1998; Meier, 1999; Schneider, 1999; deLeon and deLeon, 2002). deLeon and deLeon (2002) contend "after thirty years of careful study, one would have to hope for more theory than is currently on the policy implementation plate" (p. 473). Implementation research is a fragmented field of research in which there is no general consensus or agreement on theories, approaches, or even definitions.

Top-Down versus Bottom-Up

The most prominent and basic dichotomy of implementation models are the top-down versus bottom-up approaches. The former suggests a centralized hierarchy of authority for decision making, while the latter suggests a decentralized decision making approach with authority distributed through the organization. Of course each exhibits its own set of strengths and weaknesses, but the competition between these two approaches frames the traditional views of the implementation process.

The top-down approach sees "implementation as concern with the degree to which the actions of implementing officials and target groups coincide with the goals embodied in an authoritative decision" (Matland, 1995, p. 146). Initial studies followed the first generation approach of following the execution of a basic decision from a statute, executive order, or court decision (Mazmanian and Sabatier, 1989). The starting point of inquiry was the authoritative decision. Actors with a central role in the process were viewed as most relevant to the process and in influencing the outcomes (Van Meter and Van Horn, 1975; Mazmanian and Sabatier, 1981; Mazmanian and Sabatier, 1989; Matland, 1995). The sheer nature of the approach led to a focus on variables that were centrally controlled and coordinated. The desire was to develop generalizable policy advice that could be applied by administrative agencies and policymakers alike across the board of policy areas and jurisdiction. To do so, scholars had to produce findings with consistent patterns that could be inferred from the research. Thus, findings tended to be prescriptive rather than descriptive of the implementation process. The consistent findings of these studies were to reduce the ambiguity in policy goals, minimize actors involved in the process, limit change, and coordinate implementation under agencies sympathetic to the goals (Van Meter and Van Horn, 1975; Mazmanian and Sabatier, 1989; Pressman and Wildavsky, 1973; Sabatier, 1986; Matland, 1995).

The two most significant top-down attempts to develop a theory of implementation are: Van Meter and Van Horn (1975) and Sabatier and Mazmanian (1980). Van Meter and Van Horn (1975) was the first comprehensive attempt to integrate variables and develop a conceptual framework for the analysis of implementation. Van Meter and Van Horn (1975) set out to develop a conceptual framework for implementation guided by the literature on organizational change, the impact on public policy, and intergovernmental relations, which would include empirically testable hypotheses. They identified six classes of variables effecting policy performance: 1) standards and objectives as concrete, easily measureable, and specific goals for program performance beyond the ambiguity inherent in legislation; 2) available resources made to an organization which effect capacity for action; 3) clarity in communication for standards and objectives to implementers, and consistency in enforcement of those standards and objectives; 4) administrative agency characteristics, including staff competence and size, hierarchical controls, political resources, degree of open communications, organizational vitality, and formal and informal linkages with elected officials; 5) the economic, social, and political conditions which have a profound effect on agencies; and 6) the perceptions of the implementers through which the other components of the model may be filtered. There is a direct hypothesized relationship between policy performance as the dependent variables and the economic, social, and political conditions, organizational characteristics, and the disposition of implementers as the independent variables. It is hypothesized the other classes of variables only have an indirect relationship to performance, but a direct relationship with the other classes of variables. However, Van Horn and Van Meter (1975) has been heavily criticized for the lack of sophistication in accounting for aspects of the implementation process (Sabatier and Mazmanian, 1980).

Sabatier and Mazmanian (1980), building on the work of Van Meter and Van Horn (1975), developed one of the most comprehensive lists of variables. Sabatier and Mazmanian (1980) develop a more sophisticated version of the implementation process. They identify three general sets of factors. Within these general sets of factors, the authors forward a series of testable hypotheses and include one of the most comprehensive lists of variables developed (Lester et al, 1987). First, tractability of the problem refers to the “ease” at which social problems can be dealt. Valid technical theory and technology, diversity of target group behavior, the portion of the target group within the population, and extent to change required are all variables relative to the tractability of the problem. Second, the ability of statute to structure implementation refers to the ambiguity in goals and the discretion necessary for the implementation process. Ambiguity in policy directives, available resources, hierarchical integration, decision-making rules, recruitment of implementing officials, formal access by outsiders, and causal theory for the implementation process are variables relative to the statutory structuring of the implementation. Finally, non-statutory variables affecting implementation are the political support relative to a program and the socio-economic environment which affects public needs. Identified as the variables most likely to affect successful implementation, the non-statutory variables include the socio-economic conditions, available technology, media attention, public support, attitudes and resources of constituency groups, support for sovereigns, and commitment and leadership of implementing officials. However, the expansiveness of the model has drawn pointed criticism for the lack of parsimony (O'Toole, 2000).

The top-down approach has been heavily criticized by scholars along three avenues (Matland, 1995). First, there is an assumption that the implementation process begins with the statutory language. By making this assumption, implementation is removed from the context of the larger policy process as the actions taken in earlier stages are not considered which can provide guidance to the intent of the policymakers or the desired outputs or outcomes (Winter, 1986; Nakamura and Smallwood, 1980; O'Toole, 1989; Matland, 1995). Second, top-down scholars focus too heavily on the administrative aspects of the implementation process, while overlooking the inherently political nature of administration. The nature of the policymaking process causes all stages to be significantly affected by politics, as it can neither be removed nor manipulated by administrators in any substantial way (Berman, 1978; Baier, March ,and Saetren, 1986; Matland, 1995). Furthermore, as part of the long-standing debate in public administration, contemporary scholars concede that administration is inherently political and can never be wholly separated from politics (Appleby, 1945; Waldo, 1948; Svara, 2001; Demir and Nyhan, 2008; Svara, 2008). Finally, top-downers fail to recognize actors other than statute framers as key to the policymaking process. The underlying assumption has led to a theoretical perspective of a Weberian-type bureaucratic model (Weber, 1947; Fry and Raadscheiders, 2008). The normative perspective suggests bureaucrats as closer to the people have a greater ability to make decisions that represent the interests of the polity as they have a more direct experience and knowledge with the issues surrounding the local problems (Krislov and Rosenbloom, 1981; Matland, 1995). Additionally, critics contend discretion of street-level bureaucrats can never be completely eliminated nor can it be completely controlled by a central authority; thus, it will always play some role in the implementation process (Lipsky, 1980).

The bottom-up approach, on the hand, contends "a more realistic understanding of implementation can be gained by looking at a policy from the view of the target population and the service deliverers" (Matland, 1995, p. 148). The implementation process consists of two equally important components. At the macro level, actors with central authority formulate and design policies and programs. At the micro level, local authorities respond the plan devised at the macro level by developing and implementing their own programs (Berman, 1978). The implementation problem results from the interaction and conflict that occurs when the macro plans meet the micro context (Berman, 1978; Palumbo, Maynard-Moody, and Wright, 1984). The goals, strategies, actions, decision-making approaches, and capacities of local actors differ making the context variable between jurisdictions. The local context of implementation must be understood to grasp process by which it occurs (Matland, 1995). Additionally, policies influence bureaucrats and their decisions in different ways, as bureaucrats retain a level of discretion that enables them to effect policy outcomes (Weatherley and Lipsky, 1978). The bottom-up perspective was most notably solidified in Lipsky's (1980) study of street-level bureaucracy. The crux of Lipsky's argument is that ambiguity and uncertainty inherent in legislation as a result of the political bargaining process necessary to satisfy interests in earlier stages of the policy process require street-level bureaucrats to exercise significant discretion in the implementation process. There is frequently a gap between the policy established by the political branches of government and the implementation undertaken by the bureaucracy, and this gap leaves ample room for bureaucrats to exercise their own discretion. Street-level bureaucrats are those who work directly with the public to provide services and, thus, have the most substantial role in actually applying the policy and rewarding benefits to clients. These street-level bureaucrats develop routines and operating procedures to simplify the performance of their duties, and perceptions of the reality of the environment of implementation that may not best serve citizens. Street-level bureaucrats operate in conditions that are critical for determining the delivery of services but that can curtail or distort policy implementation. These conditions include: ambiguous, vague, and conflicting expectations; inadequate resources for the required tasks; performance goals difficult to measure; increasing and uncontrollable demand for services; and client groups who are an unreliable source of information (Lipsky, 1980). The essential element here is that the political branches cannot control bureaucrats like cogs of a machine, or in other words policy cannot effectively shape the implementation process. Therefore, bureaucrats must assume a substantial role in the implementation process as it is necessary for them to make substantial decisions about the delivery of services.

Bottom-up scholars believe it to be impractical to expect a generalizable theory that is context free, as implementation is effected by the setting (Maynard-Moody, Musheno, and Palumbo, 1990). In this way, policy success depends on the skill of street-level bureaucrats to adapt policy to the local context (Matland, 1995). The bottom-up approach calls for a focus on the micro-level actors, their goals, activities, and problems to study a policy problem, and to identify from there the relevant network structure for a specific policy at each level as well as any strategic coalitions or indirect effects (Hjern, 1982; Hjern and Hull, 1985; Hull and Hjern 1987). Researchers attempt to highlight the factors that create obstacles and handicap goals. However, the highlighting of contextual factors and the use of inductive logic results in few policy recommendations or practical advice for policymakers or bureaucrats. The only consistent, real recommendation is the need for flexibility in strategy and statutory structure to allow for adaptation to individual contextual elements (Maynard-Moody, Musheno, and Palumbo, 1990; Matland, 1995).

Criticisms of the bottom-up approach appear along two avenues (Matland, 1995). First, in the context of normative political theory, the bottom-up approach allows a significant role for actors whose power does not derive from the sovereign voters. Street-level bureaucrats have not been elected to their position, nor are they directly accountable to the polity, which seems illegitimate in a democratic system for those who carry so much influence in policy outcomes and service delivery. Only the elected representatives enjoy such legitimacy as there power is derived from the polity, but that power is usurped by the bureaucrats in the bottom-up approach (Matland, 1995; Miller and Fox, 2007). Of course, the principal-agent problem exemplifies the potential for the illegitimate use of power to the detriment of the people (Eisenhardt, 1989). The principal-agent problem exists when information asymmetries allow agents to seek goals that differentiate from those of the principal. In the case of bureaucracy, bureaucrats have greater information about whether they have satisfied their responsibilities than the relative political officials, allowing them the potential to act outside of the contract with their principals (Mitnick, 1975; Moe, 1984; Eisenhardt, 1989). Second, the methodological approach overstates the independence of local authority. In most cases, the institutional structure, resources, and authority for implementation are controlled not by local authority but by central authority. The bottom-up approach disregards the influence of the central governance structures and processes in implementation (Matland, 1995).

The competition between the top-down and bottom-up perspectives has been instrumental in defining implementation research. Scholars of both perspectives have harshly criticized theory and research of the other. There has yet to be any sustained consensus on the topic within the field. However, both perspectives do have important theoretical contributions to make to the understanding of the implementation process.

Unifying Perspectives?

The top-down and bottom-up approaches represent the most basic debate in the implementation literature. Nevertheless, O'Toole (2000) contends the field has "moved past the rather sterile top-down, bottom-up dispute" in the wake of attempts to rectify the two approaches, which are nothing more than different perspectives of the same issues (p. 267). Several scholars have attempted to solve the debate through either combining the two approaches into a single model or by identifying conditions for which one approach is more effective than the other (Matland, 1995).

There are three notable attempts to abandon the top-down/bottom-up dichotomy in favor of uniting the two into a single model: Elmore (1985), Sabatier (1986), and Goggin et al (1990) (Lester et al, 1987; Matland, 1995; O'Toole, 2000). Elmore (1985) was the first attempt to do so through an incorporation of a forward and backward mapping approach to implementation, which was intended to combine the use of policy instruments available by policy makers and incentive structure for target groups. Forwarding mapping involves reducing the ambiguity and conflict involved in the implementation process by clarifying objectives, charting paths to desired outcomes complete with task prescriptions, and developing performance evaluation criteria for each stage of the process. Backward mapping involves identifying behavior changes necessary for the front-line operators, developing a scheme to insure that change becomes embedded, and following a similar procedure for each level of the bureaucracy in hopes of creating a better system for the use of discretion by lower level bureaucrats. For programs to be successful, policy designers must more effectively include the 'micro-implementers' and target groups in the planning process of the policy and implementation strategizes. However, Elmore (1985) provides no predictions or testable hypotheses. Due to the lack of explanatory power, it falls more into the category of normative theory of the implementation process than a framework for the analysis of program implementation.

Although Paul Sabatier was one of the pioneers of the top-down approach, he vacated this perspective in favor of a more general theory of the policy process, known as the Advocacy Coalition Framework (see Sabatier and Weible, 2008). Sabatier (1986) contends policies implemented within a set of parameters are most easily identified by the top-down perspective and remain stable over long periods of time. These parameters include socioeconomic conditions, legal instruments, and the basic government structure. However, within this structure substantial action occurs, a concept borrowed from the bottom-up perspective. In this way "his synthesis combines the "bottom-uppers", unit of analysis (i.e., a whole variety of public and private actors involved with a policy problem) with the "top-downers," concerns over the manner in which socioeconomic conditions and legal instruments constrain behavior" (Lester et al, 1987, p. 206). Sabatier (1986) argues the main unit of analysis for explaining the actions occurring within the parameters are the groups of policy advocates sharing the similar beliefs and goals and seek to have views accepted by legitimate actors, or, in short, the advocacy coalitions. Additionally, he contends policy needs to be studied in ten or more year cycles to account for policy learning. However, in doing so, the theory becomes far too broad to apply only to implementation; rather, it is a theory of the entire policy process (Matland, 1995). Sabatier (1986) admits this serves as an exercise in "theory construction rather than with providing guidelines for practitioners or detailed portraits of particular situations" (p. 39).

Goggin et al (1990) was an attempt to push implementation theory into a third generation of research, using a communications model of intergovernmental policy implementation. The vision for this third generation, for which Goggin et al (1990) would be the starting point, would be to explain "why behavior varies across time, across policies, and across units of government and by predicting the type of implementation behavior that is likely to occur in the future. In a word, the objective of third generation research is to be more scientific" (p. 179). The model presents states as the point of integration between communication channels reaching through all three levels of government (Goggin, et al, 1990; Matland, 1995). The model is separated into three clusters of variables. The first cluster is inducements and constraints from the top, serving as feedback signals from the federal level to the state or local levels. The second cluster is inducements and constraints from the bottom, serving as feedback signals from the state and local levels to the federal level. The third cluster is the environmental context in which implementation occurs unique to each state. The signals through the intergovernmental network are meant to communicate desired changes in behavior; however, they can be misinterpreted or distorted. State implementation is, therefore, a result of the outcomes from the inducement and constraints communicated to state government from other levels of government. The authors contend the implementation process is comprised of variables from both top-down and bottom-up approaches, and integrate such variables into this model to create a number of hypotheses (Goggin, et al, 1990; deLeon and deLeon, 2002). However, these hypotheses prove to be too ambiguous to be tested (deLeon and deLeon, 2002).

Additionally, principal-agent theory should be noted for its potential in unifying theoretical concepts of the implementation process. Though it has received less interest by implementation theorists, principal-agent theory has shown promise for creating a theoretical framework for implementation (O'Toole, 2000; deLeon and deLeon, 2002). Perrow (1986) describes it as: "agency theory assumes that social life is a series of contracts. Conventionally, one member, the 'buyer' of goods or services is designated the 'principal,' and the other, who provides the goods or service is the 'agent'" (p. 224). In short, this model of bureaucratic behavior presents bureaucracies serving as agents contracted to serve the interests of their principals in political officials (Mitncik, 1975, 1980; Moe, 1982, 1984, and 1985; Wood and Waterman, 1994; Waterman and Meier, 1998). Problems occur as information asymmetries are created, and moral hazards and conflict of interests present themselves. Bureaucrats may seek goals other than those contracted by their principals based on their position in the system (Mitnick, 1975; Moe, 1984; Perrow, 1986; Waterman and Meier, 1998). Wood and Waterman (1994) contend bureaucratic actions are effected by factors from both the top and bottom, taking into account both traditional perspectives of implementation behavior. Many scholars have used principal-agent to explain bureaucratic politics, but have not made any significant attempt to explain the implementation process.

Rather than attempt to combine approaches into a single theoretical framework, some scholars have supported contingency theories to identify situations when one approach is more useful than the other. Contingency theorists contend that while implementation studies offer a list of variables with the potential to impact the implementation process, they have neglected to adequately address the conditions under which these variables may or may not be important and why (Matland, 1995). deLeon and deLeon (2002) argues “the most important observation gleaned from….contingency theorists is that there is no single best implementation strategy, that the appropriate strategy is very much contextual in terms of what are the contingencies surrounding the policy issues and how they can best be addressed in terms of implementation” (p. 471). Early manifestations of contingency theories contended the choice between a top-down or bottom-up approach is dependent on the phase of the implementation process (Dunsire, 1978) or the policy context and situational parameters (Berman, 1980).

Later theorists began to offer 2X2 matrices which suggest conditions for different strategies for implementation as a potential device for rectifying the opposing positions (Ingram, 1990; Scheberle, 1997; Matland, 1995; deLeon and deLeon, 2002).

The most notable of these contingency models, however, is the conflict-ambiguity model, which “attempts to provide this more comprehensive and coherent basis for understanding implementation” (Matland, 1995, p. 155). As the title suggests, the appropriate strategy for implementation is based on the degree of conflict and ambiguity present. Conflict occurs when multiple organizations perceive a policy is important for their interests and organizations and/or actors have inconsistent views on the policy. The resulting conflict causes actors in the implementation process to rely on bargaining mechanisms to find agreement and move forward. Ambiguity creates numerous problems in consistency for managers and bureaucrats including understanding of goals, monitoring of activities, and roles of individual actors (Matland, 1995).

Matland (1995) identifies four different types of implementation based on the degrees of conflict and ambiguity. First, low conflict and ambiguity leads to administration implementation. Outcomes are contingent solely on resources; as long as sufficient resources are allotted the outcome is certain. In the case of administrative implementation, top-down implementation models are the most effective. Second, high conflict and low ambiguity leads to political implementation. Outcomes are affected by the balance of power between actors or coalitions of actors. Third, low conflict and high ambiguity leads to experimental implementation. The environmental conditions, actors, and resources dictate the implementation process, with the conditions taking the form of a "garbage can" model with actors, problems, solutions, and choices streaming together to create unpredictable outcomes. In the case of experimental implementation, bottom-up models are preferable. Finally, high conflict and ambiguity leads to symbolic implementation. Outcomes are dependent on local coalitions and their control of resources. Matland (1995) concludes there are "both schools contain kernels of truth relevant in any implementation situations," but implementation is contingent on the situation in which it occurs (p. 171). While contingency theories appear to present the best of both worlds, they are merely theories of the context of implementation, rather than theories of the implementation process. On their own, contingency theories offer little direction to practitioners or hypotheses for researchers. Only when combined with more complete models of the implementation process, they can be useful to both research and practitioners.

Moving beyond the top-down versus bottom-up controversy, scholars have attempted to become more sophisticated in the development of implementation theory. Integrated approaches, such as those used by Elmore (1985), Sabatier (1986), and Goggin et al (1990), have began to develop theory using variables and concepts from both top-down and bottom-up perspectives, within alternate frameworks. However, these attempts have not been fruitful in bringing together the field of implementation theory under a single theoretical perspective, as they have been criticized for lack of parsimony or testable hypotheses. Other scholars have developed contingency theories to indicate when one model is more effective than the other; but, they offer no theoretical framework for the analysis of the implementation process. Attempts at building a theory for the fabled third generation of implementation research have yet to be realized.

Implementation of Environmental Policy

While the mass of research on environmental policy has focused on state environmental efforts or policy adoption (Konisky and Woods, 2011), research questions regarding the implementation of national environmental policy by state governments have arisen before now, leading to several studies of the surrounding issues. Top-down models have proven to be the most popular theoretical approach, but other approaches have shown some promise as well. Environmental policy implementation research has followed the trends of the broader implementation research field.

The first trend in this area was the case study based approach for offering guidelines for understanding the implementation process. While these case studies offer a varying degree of theoretical or methodological sophistication, they do offer a few insights into the implementation of such policies. First, organizational characteristics and political pressures were significant in effecting the responses from agencies in implementation (Andrews, 1976). The procedures outlined in National Environmental Policy Act of 1969 (NEPA) did not force the attainment of goals rather goal achievement was greatly influenced by individual implementers and their interpretations of the procedures and their responsibilities (Andrews, 1976). Second, implementation occurred in phases as the administrative process and procedures evolve along with the perceptions and approaches of agency leadership, staff, and clientele (Wichelman, 1976). In other words, implementation is not a static process; implementers have a tendency to learn over time (Sabatier and Weible, 2007). Third, while political actors may insert themselves into the administrative process from time to time, implementation is a mainly administrative function (Cortner, 1976). Care must be taken to not overemphasize the role of the political environment, because bureaucrats, not politicians, are the ones charged with implementing policy. Finally, progress towards legislative goals only occurs when ambiguity is not present in legislation (Andrews, 1976; Drisen, 1996). When ambiguity is inherent, bureaucrats will be force to use discretion, which will only result in unpredictable results (Lipsky, 1980).

The next step in the development was to begin to apply top-down and bottom-up models of implementation to environmental policy. Many of these studies focused on the context of implementation, which is accepted in top-down and bottom-up models as a significant factoring in effecting outcomes. Nevertheless, the approach of these studies has been strongly influenced by the top-down perspective, with a focus on contextual issues and with little attempt to capture bureaucratic behavior or the use of discretion. The bottom-up approach has not proven to be as popular in environmental policy as the top-down approach. This may be a result of a simple observation that the policy area dictates a certain type of implementation model (Sabatier, 1986).

These top-down models of environmental policy implementation tend to focus heavily on the political, economic, or organizational characteristics of state government (Crotty, 1987; Lowry, 1992; Scheberle, 2004; Woods, 2006). These scholars contend implementation is a component of the overall behavior of state governments, hinging on state leadership (Lowry, 1992), "high-stakes" politics (Scheberle, 2004), or the general political environment (Crotty, 1987; Woods, 2006). Variables identified include target groups, political forces Scheberle, 2004), organizational characteristics, relationship with the federal government (Crotty, 1987; Woods, 2006), power and leadership from the executive branch (Lowry, 1992; Woods, 2006), public environmentalism, political culture (Woods, 2006), and economic factors (Lester and Bowman, 1989; Woods, 2006). While these studies have found significant results, they can be criticized for the inherent assumptions of the top-down perspective, which disregard bureaucratic discretion as a factor effecting implementation. Additionally, the focus on contextual variables of these studies shares similarities to the state politics approach, which carries its own set of criticisms; most notably the lack of theoretical sophistication in connecting contextual conditions to outcomes on more than just a correlative basis (see Chapter 3). In effect, these studies have confirmed that context matters for the implementation of environmental policy, but offer little theoretical explanation of the implementation process.

In an attempt to test a more complete top-down model, Lester and Bowman (1989) apply the Sabatier-Mazmanian model (1980) with the implementation of the Resource Conservation and Recovery Act of 1976 (RCRA). Testing a number of hypotheses related to the tractability, statutory, non-statutory elements of implementations, they find support for some hypotheses included within each category. The most significant variables were the economic importance of the target group, diversity of the state's economy, organizational integration, and ambivalence over policy goals. The authors contend:

> "the findings imply that utility of the Sabatier and Mazmanian model lies in its identification of a comprehensive set of factors that may affect intergovernmental policy implementation generally. It appears…that a subset of critical variables can be extracted from the comprehensive model" (Lester and Bowman, 1980, p. 750).

Alternatively, other scholars have applied more sophisticated models of implementation. Wood (1992) uses a two-tier model of federal-state relations to test the implementation of the Clean Air Act. Both centralized and decentralized variables were included to test the applicability of top-down and bottom-up perspectives. The findings indicate implementation outcomes are influenced at multiple levels, with neither top-down or bottom-up perspectives fully capturing the dynamics of the process. Cline (2003) applies the communication model developed in Goggin et al (1990) to intergovernmental implementation of the Superfund program. Using federal grants and interest groups to represent inducements from the top and bottom of the system, respectively, the findings indicate there is a pronounced importance of state-level factors, such as organizational capacity, in determining implementation outcomes in a federal system.

The literature on environmental policy implementation suggests three lessons for research in this area. First, context matters. Many of these studies rely heavily on contextual factors to account for differences in implementation outcomes, and their results do indicate a significance of these factors (Andrews, 1976; Crotty, 1987; Lester and Bowman, 1989; Lowry, 1992; Scheberle, 2004; Woods, 2006). Second, top-down models neither fully account for variation in implementation outcomes nor are they the only models that explain implementation outcomes. While the top-down variables have been consistently found to be significant in explaining implementation outcomes, these models are by not perfect in accounting for differences across states (Crotty, 1987; Lester and Bowman, 1989; Lowry, 1992; Scheberle, 2004; Woods, 2006). On the other hand, variables from other theoretical approaches have been found to be successful in explaining variation as well (Wood, 1992; Cline, 2003). Finally, implementation outcomes are effecting by variables at multiple levels. (Wichelman, 1976; Cortner, 1976; Wood, 1992; Cline, 2003). The implementation of environmental policy is clearly a complex and intricate process, which current research has not fully captured.

Conclusion

Implementation theory has evolved significantly since the early case studies of Great Society social programs in the first generation of implementation research. The dominate theme in implementation has been the top-down versus bottom-up debate. Top-down models place emphasis on the role of centralized decision-makers in the process, and the vital role of context in effecting outcomes. Bottom-up models contend street-level bureaucrats carry crucial discretion in decision-making at the front-lines of service delivery, which cannot be completely stifled in practice. The two perspectives suggest different frameworks for analyzing the same phenomenon (O'Toole, 2000). Of course, both approaches have been heavily criticized. The top-down approach overlooks the effects of politics and administrative discretion in the implementation process

(Matland, 1995). A virtual library of literature suggests that discretion is an integral component in the administrative process (Simon, 1997; Lipsky, 1980; Mazmanian and Sabatier, 1989; Scott, 1997; Sowa and Selden, 2003), and the administration is inherently political (Appleby, 1945; Waldo, 1948; Svara, 2001; Demir and Nyhan, 2008; Svara, 2008). The bottom-up approach has been criticized for placing a premium on the role of non-elected political actors in determining policy outputs, and for the lack of testable hypotheses (Matland, 1995).

In response to the competition, some scholars have attempted to reconcile the perspectives either through integrated models with elements of each approach or through contingency theories which suggest each approach is applicable under certain conditions. While several of these attempts have gained attention, none have been successful in creating a consensus among scholars. The intellectual development of implementation theory has been stalled by the lack of parsimonious frameworks in which to investigate the process and outcomes (O'Toole, 2000; deLeon and deLeon, 2002). Integrated models have failed to either create parsimonious frameworks or testable hypotheses (Matland, 1995; O'Toole, 2000; deLeon and deLeon, 2002). Contingency theories, on the other hand, do not create any framework for analysis; they only suggest the use of other frameworks based on context (O'Toole, 2000; deLeon and deLeon, 2002). The result is the lack of an acceptable theoretical framework to account for the role of implementation decisions in effecting policy outcomes.

The extant research suggests the impact of the implementation process on environmental policy outcomes has been noteworthy. Findings from both case study research and more sophisticated analysis indicates the implementation process have been instrumental in defining the policy outcomes, especially in terms of the use of discretion within the ambiguity of legislation to create schemes which vary by agency. Applications of existing theoretical frameworks, however, fall short in explaining the deviations in policy outcomes. Thus far, variables from top-down, bottom-up, and combined models have proven significant in environmental research. While the implementation of environmental policy has not been fully accounted for theoretically, it is clear that is a critical component in determining outcomes.

The existing theoretical models of implementation share three important components for developing an integrated approach. First, the context of implementation shapes the implementation process. Regardless of the model prescribed to, no scholar has written off the role of the conditions surrounding implementation efforts in effecting outcomes. The context can be measured by numerous means. However, it seems that the social, economic, and political conditions are among the most cited. Additionally, the organizational characteristics of implementing agencies have been recognized for their impact, as well (Van Horn and Van Meter, 1975; Sabatier and Mazmanian, 1980; Lipsky, 1980; Lester et al, 1987; Goggin et al 1990). For a more detailed discussion of state political, economic, and cultural context, and organizational characteristics in effecting policy outcomes see Chapters 3 and 4, respectively.

Second, the decisions of street-level bureaucrats matter. Lipsky (1980) was the first to make that bold statement, but other scholars have at least tried to integrate the concept somehow. Van Meter and Van Horn (1975) refer to the disposition of implementers as the filter for the components of their model. Elmore (1985) draws attention to the behavioral changes necessary for front-line operators. The decisions of implementers cannot be ignored as a component of the implementation process. As Simon (1947/1997) contended: the unit of analysis in the administrative process is the decision. Other theoretical frameworks seem to recognize this concept, but refuse to take the next step of integrating it into the model (Van Meter and Van Horn, 1975; Lipsky, 1980; Elmore, 1985). The decisions of implementers are the connection between the conditions and the outcomes. Clearly, political preferences do not directly translate into environmental outcomes. However, political preferences can pressure implementers into making certain decisions. Thus, the decision should be the basic unit of analysis in the implementation process, with the context shaping the process by which these decisions are made.

Finally, the factors effecting implementation do not exist at a single level. Several models go as far as to include directional flow of the theoretical models from higher levels to lower levels. Van Meter and Van Horn (1975) argue organizational characteristics flow through implementer dispositions before effecting policy outcomes. Sabatier and Mazmanian (1980) model the tractability of the problem at a different level than the non-statutory variables effecting policy outcomes. Lipsky (1980) suggests decisions of street-level bureaucrats are effected by context, which implies a multi-level theoretical model. Therefore, any framework for the implementation process should recognize variables are operating at multiple levels in the implementation process and should be modeled as such (Heinrich and Lynn, 2000; O'Toole, 2000; Roderick, 2000). The next chapter will present a analytical framework based on the literature reviewed over the last three chapters. The crux of the theoretical approach is that the decisions made by the micro-level implementers has the most direct role in effecting policy outcomes, but those decisions are shaped by the contexts in which they are made.

CHAPTER 6

THEORETICAL FRAMEWORK

The intent of this chapter is to present the theoretical framework to analyze state implementation of federal environmental policy, and background to multiple level statistical modeling. First, the framework of analysis will be delineated to connect the variable choice with theory. Both a general theory of the implementation process and an application of this theory to the implementation of the Clean Air and Water Acts will be introduced to outline the theoretical approach to the research. The theoretical framework is a key to proper specification of the model.

Research Outline

The implementation process is complex and intricate with many interconnected elements and potential causal relationships. The question this research seeks to answer: is what role do implementation decisions by front-line operators play in effecting policy outcomes in the implementation of the CAA and CWA? Relative to this question is: how does the context of decision-making shape implementation decisions? The basic theoretical approach is implementation decisions made by front-line operators are the most direct element of the implementation process in effecting policy outcomes. The criteria by which front-line operators are making decisions shape their actions and the enforcement, administration, and oversight of these policies. The organization sets the context in which these basic decisions are being made. The organization is the most basic element to constrain decisions by directly imposing incentives for actions on front-line operators. The organization, in turn, exists in the context of socio-political and economic conditions. The socio-political and economic environment places direct constrains on the organization through the influence of policy stakeholders. In sum, politics influences organizational management, organizational management influences implementation decisions, and implementation decisions influence policy outcomes.

To test this model, a hierarchical linear model provides for the testing of a multi-level statistical model. This model is unique in two aspects: 1) it assumes implementation decisions as having the most direct impact on outcomes; and 2) it tests implementation process as a multi-level model. The policy outcomes are measured, for the CAA, as the worst air quality monitoring state per state, and, for the CWA, as the percentage of impaired waterways under state-level assessments. The first-level predictors of the statistical model are the decision-making criteria for front-line operators, which is modeled as having a direct effect on policy outcomes. A survey instrument is used to collect data on a series of questions concerning the decision-making criteria used by front-line operators. The second-level predictors of the statistical model are the contextual factors of these decisions with organizational characteristics and socio-political and economic characteristics of the states. The second-level predictors are modeled as having a direct effect on the first-level predictors, and an indirect effect on the policy outcomes. A combination of a survey instrument and state-level data from public sources are used to collect data on several variables at the organizational and state level of analysis. The results of the model should indicate the role of implementation decision-making on policy outcomes, and the influence of contextual factors in shaping implementation decisions.

Analytical Framework for the Policy Implementation Process

The previous chapters have presented literature related to policy implementation and outcomes in general, and specifically for environmental policy. The attempt here is to begin with an analytic framework for the policy implementation process, then apply this framework to explain the implementation of the Clean Air and Water Acts. The outline of the analytical framework is outlined in Figure 6.1.

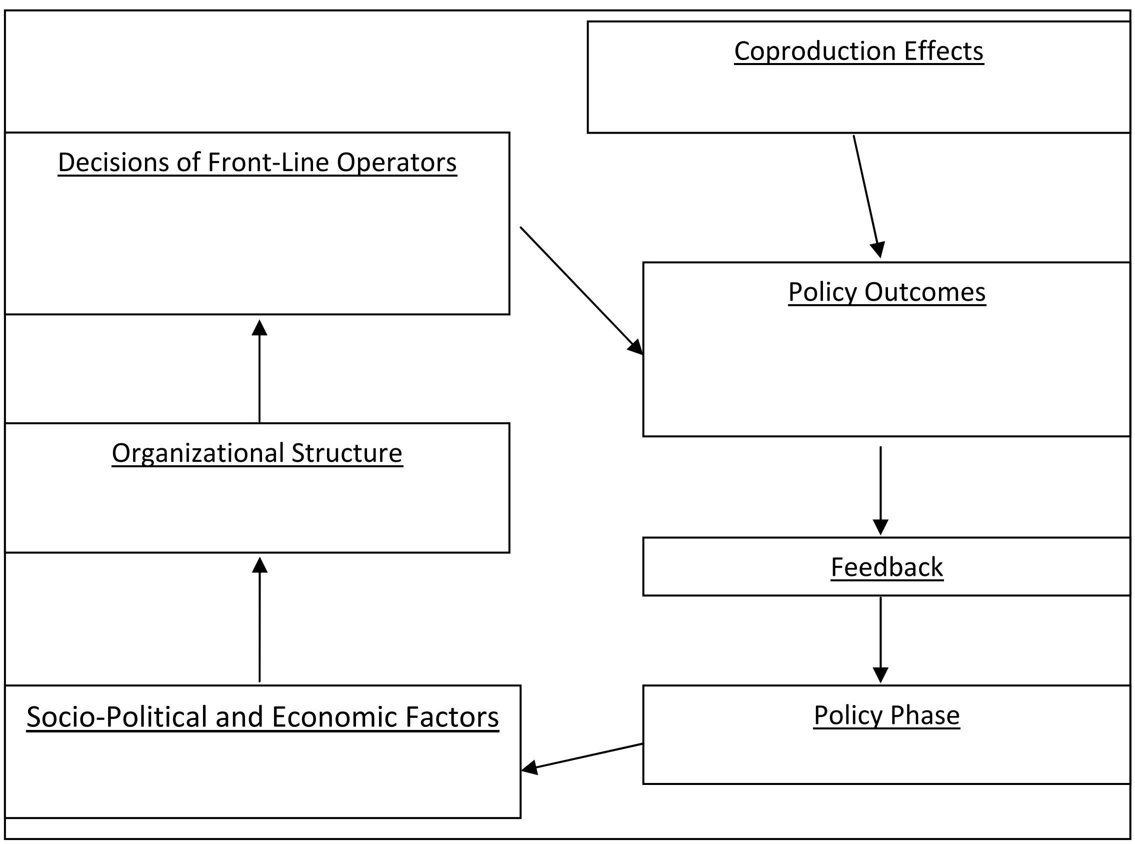

Figure 6.1

Analytical Framework of the Implementation Process

Policy outcomes are most directly affected by the decisions made by the front-line operators during implementation. A policy statement is just a series of words until it is enforced, implemented, or administered by someone. The front-line operators are those who are actually doing the work of implementation. Even the most strictly structured policy statements must rely on front-line operators to act in accordance with their prescriptions to result in the desired outcomes. Top-down implementation models seem to take this for granted, and assume that implementers will do their job as they are instructed without independent thought. Bottom-up implementation models limit their analysis to discretionary use of decision making power (Lester et al, 1987; O'Toole, 2000; deLeon and deLeon, 2002).

Simon (1947/1997) contends the basic unit of analysis for administration is the decision. Bureaucracy does not strip front-line operators of their ability to choose whether or not to complete a task. In the extreme condition that an operator chooses not to do so, the organization is then left short-handed which affects the job tasks of other operators. The idea of work shirking is more common, in which bureaucrats attempt to avoid their work (Brehm and Gates, 1999). On top of the natural right to make decisions, ambiguity is a steadfast component of public policy. Policy-makers do not easily come to compromise so they include ambiguity as a means to allow gaps in stances on the issues. At times, bureaucrats must make decisions regarding their own actions or the interpretation of the policy inserting their set of values, interpretations, and understandings into the process. Lipsky (1980) dwells heavily on this fact. However, Van Meter and Van Horn (1975) touch on a similar idea when they contend the organizational characteristics, economic and political conditions, policy resources, and intergovernmental communication efforts "must be filtered through the perceptions of the implementer" (p. 472). They identify comprehension and understanding as well as the support of the policy as being essential in defining how implementers behave (Van Meter and Van Horn, 1975). Thus, the most basic component of the implementation process is the implementation decisions by front-line operators. These decisions and the corresponding behavior are the focus of control and leadership in organizations (Frederickson and Smith, 2003; Fry and Raadschelders, 2008). The decisions of implementers in outlining their behavior during the implementation process have a direct impact on the outcomes of policy as it defines the policy in this stage of the process.

The most direct avenue for affecting the decision-making behavior by front-line operators comes from the organizational level. The organizational level is the setting for the decisions of the front-line implementers. Front-line operators are working within the organization, with organizational elements constraining or expanding their decisions. The structure of the organization is one of the strongest tools for controlling the behavior of bureaucrats (Merton, 1940; Schein, 1988; Wilson, 1989). A highly centralized workplace with formalized job roles and close supervision leaves very little opportunity for bureaucrats to act outside the control of management. The use of standard operating procedures, structured routines, and codified rules further the control of the individual. On the other hand, more loosely controlled organizations provide extensive opportunities for independent decision-making (Gulick, 1937; Fry and Raadschelders, 2008). Additionally, the management of the organization have the capacity to structure the "logic of task" for their subordinates further constraining the decision making process. Bureaucrats who are focused on a task that is structured to produce outputs will come to conclusions differently than those whose are focused on outputs (Wilson, 1989). At the organizational level, managers can use structure to constrain the decisions of the front-line operators.

The organizational level is most directly affected in their operations by the macro-political, economic, and social environment. The political, economic, and social environment is a myriad of political, economic, social, and cultural components that come together to create the environment in which governance occurs. Front-line operators are not principally political animals who have direct contact with politicians or political interests. Organizational managers, however, are political actors (Lipsky, 1980). They serve as the agents of the political principals who are operators in the macro-environment. Waterman and Wood (1994) contend "elected officials send signals to the bureaucracy based on electoral incentives, and bureaucracies respond to these signals by actuating change" (p. 143). Based on their environmental pressures, principals apply pressure to their agents to best serve the interests of the principal, creating a link between the political environment and organizational operations (Eisenhardt, 1989). A sluggish economy does not directly impact a front-line operator or the organizational manager in their day-to-day jobs (assuming resources are held stable). However, a slow economy would cause political pressure on politicians from economic interests, who would then apply pressure on organizational managers to alter their management scheme so front-line operators begin to behave differently. The political, economic, and social environment only has an indirect impact on the decisions and, in turn, implementation behavior of front-line operators through the principal-agent connection of politicians and the organizational administrator.

The political, economic, and social environment is the setting for the management of organizations. Political actors in the mainstream political environment are those who have a direct relationship with elected public officials (i.e., public interest groups, agency administrators, state legislators, etc…). The macro-environment can include a montage of factors that while affecting the behavior of political operators are not likely to directly affect those of bureaucrats who are not subject to direct accountability to the electorate (Matland, 1995; Miller and Fox, 2007). The political actors operating in the macro-environment are directly affected by its conditions through pressure exposed by their principals or constituencies. For agency administrators, the macro-environment affects their behavior due to the pressure from their principals in the governor or state legislature. For politicians, the political, economic, and social environment affects their behavior due to the pressure from their principals in their constituencies. The agency administrators are the linchpins that connect the political, economic, and social environment to the organizational context. Political pressure from interest groups, the public, or other politicians leads to politicians attempting to manipulate the behavior of agency administrators in management of the organization, which in turn leads to the context of decision-making by front-line operators (Page and Shapiro, 1983; Eisenhardt, 1989; Erikson, Wright, and McIver, 1993).

While this explanation of the implementation process connects the political, economic, and social context to policy outcomes, it does not account for change over time. Implementation schemes tend to adapt to their changing environment. The Advocacy Coalition Framework (ACF) notes the policy learning, as the process by which policy actors become more sophisticated in their understanding of problems associated with creating and managing public policy, as an essential part of the policy process (Sabater, 1986; Sabatier and Jenkins-Smith, 1993; Sabatier and Weible, 2007). Sabatier (1986) contends implementation must be studied over long periods of time (10 or more years) to capture policy learning in the implementation process. May (1992) identifies learning in the implementation process as instrumental learning, which is the more technical side of advancing the understanding of the implementation scheme compared to the more political side of the learning the social components of generating and maintaining support for policy. The implementation process, thus, changes in response to feedback from the environment.

How do we account for learning in the implementation process? As policy outcomes are generated, they produce feedback for the political system. Those actors operating in the political system then respond to the feedback. This may entail a change in the statutory requirements, issuing of new policy statements, or informal pressure to change management strategies. The new interpretation of policy outcomes marks the beginning of new policy phase (Sabatier, 1986; Sabatier and Jenkins-Smith, 1993; Daugbjerg, 2003). Comprehensive, generalizable policy outcomes are not available on a daily basis. The production of these policy outcomes may take years depending on the policy area. Then, changes to the current scheme may take several additional years to produce different policy outcomes (Kraft and Furlong, 2009; Wholey, Hatry, and Newcomer, 2010). For example, an economic stimulus package may take years to produce economic outcomes on which genuine evaluation can be based. Once these economic outcomes are apparent, political actors can then judge whether the package has been effective in achieving ends, and adjust their economic management scheme accordingly. The result is a new economic policy phase based on an alternative or reaffirmed approach.

The macro-political, economic, and social environment is the filter for the policy phase. As statutory requirements are altered or preserved, political actors in the macro-environment must then interpret this new information and alter their behavior (Sabatier, 1986; Sabatier and Weible, 2007). For example, economic interest groups will then interpret the new policy as being positive or negative based on their stances and adjust their pressure on elected officials or organizational administrators accordingly. The policy phase contains the policy statements and statutory requirements, but also information from the previous policy stages used for interpretation of policy goals and objectives. Policy phases change as our understanding of the policy, its implications, and our efforts in implementing it change.

A hypothetical application will clarify the theoretical process. First, Congress passes a new environmental legislation bill based on a new report that shows a degeneration of U.S. environmental conditions. This marks the beginning of a policy phase. Second, the legislation is interpreted by the political actors in the macro-political environment. Interest groups begin to pressure public officials based on their respective perceptions and stances on the relative issues. Public officials, in turn, pressure organizational administrators to implement the policy in accordance with their pressures and values (i.e., do not be too stringent on compliance in tough economic times or achieve results at all costs). Third, organizational administrators alter their management framework by changing organizational components (i.e., rule enforcement). Fourth, front-line operators alter their implementation decision-making in response to the changing organizational context. Fifth, the actions of the front-line operators, over time, create policy outcomes. Sixth, policy outcomes present feedback to political actors, who then alter the existing policy framework and create a new policy phase. Finally, steps two through six repeat ad nauseam.

Factors external to the implementation process cannot be overlooked when considering the implementation process. These are the coproduction effects. Coproduction "is a process through which inputs from individuals who are not in the same organization are transformed into goods and services" (Ostrom, 1996, p. 1073). The term was originated by Eleanor Ostrom to explain crime rates in Chicago as an interaction between citizens and police. Efforts from police alone could not reduce crime, it required input from citizens as well (Ostrom, 1972). For example, the outcomes of learning are not a result of teacher effort alone the inputs from students are also paramount in educational outcomes. Inputs from the public shape public problems and policy outcomes as much as inputs from the government. Outside of the role of government there are citizens participating in creating or solving public problems. These factors are external to government and cannot be accounted for solely by considering public processes. The coproduction effects must be included to account for the production of the problems which fall outside of the government.

It is important to address the most important critiques of previous implementation theories in the development of this framework. The critiques being previous frameworks have either offered no hypotheses, they are too vague to actual test, or models lack parsimony (Lester et al, 1987; Matland, 1995; O'Toole, 2000; deLeon and deLeon, 2002). The general framework offers the opportunity to glean several hypotheses about the relationship between levels of political actors and the implementation process. However, these hypotheses would be fairly vague and general, and provide no specific mechanisms for testing. This was the intent. The general framework is meant as a guide to analysis the general implementation process. Only in applying this framework to a specific scheme (i.e., the Clean Air Act) can we produce testable hypotheses.

Why? The operationalization of the general factors discussed in this framework should be different based on the policy. The general factors can take on many different forms (i.e., how do we measure party competition, or economic development). There is no single right answer for capturing these concepts. The operationalization of these concepts should be relative to the policy issues at hand. For example, while there may be some similarities, the economic factors effecting environmental policy and educational policy should be different. The existing literature on environmental policy indicates the size of the manufacturing and utilities industries of state economies effects policy outcomes (see Chapter 3). It is not likely that these specific industrial sectors have the same effect on educational outcomes, though. To make such hypotheses in the general framework would leave it ineffective for use in multiple policy areas. However, in the specific application of the framework to the implementation of the Clean Air Act, such hypotheses will likely produce significant results. Thus, the general framework should be used as a guide for connecting variables theoretically to policy outcomes and to identifying variables within the implementation process. The usefulness of the general framework should be measured in whether it can effectively be applied to a wide range of specific implementation efforts and remain effect.

Additionally, the general framework provides a relatively simple approach to explaining the implementation process. The application of the framework to specific implementation schemes can develop as complex or as simple as individual researchers wish. The following application to the CAA and CWA will not be relatively parsimonious, but the intent is to identify the multitude of factors that affect implementation for these acts. Alternatively, the application could be limited to very few variables and become more parsimonious in comparison. The general framework provides researchers a flexible framework to meet their needs of inquiry, as compared to more rigid frameworks that offer little or no flexibility. The general framework was developed with these critiques in mind. There is not a magic bullet to meet the needs of all researchers and adequately explain implementation phenomenon across governments and policy areas. However, this general approach provides a theory that can be adapted to any implementation phenomenon, but allows for flexibility in application to meet the needs of inquiry.

Model of CAA and CWA Implementation

The application of the general implementation framework to the CAA and CWA requires a consideration of the factors that are specific to environmental policy implementation. The measurement of these variables will be discussed in detail below based on the organizational level within the model. The logic of identifying these variables should be articulated when considering the specification of the model, as this is the application of a general framework to a specific phenomenon. Figure 6.2 outlines the specific variables included in the implementation model for the CAA and CWA.

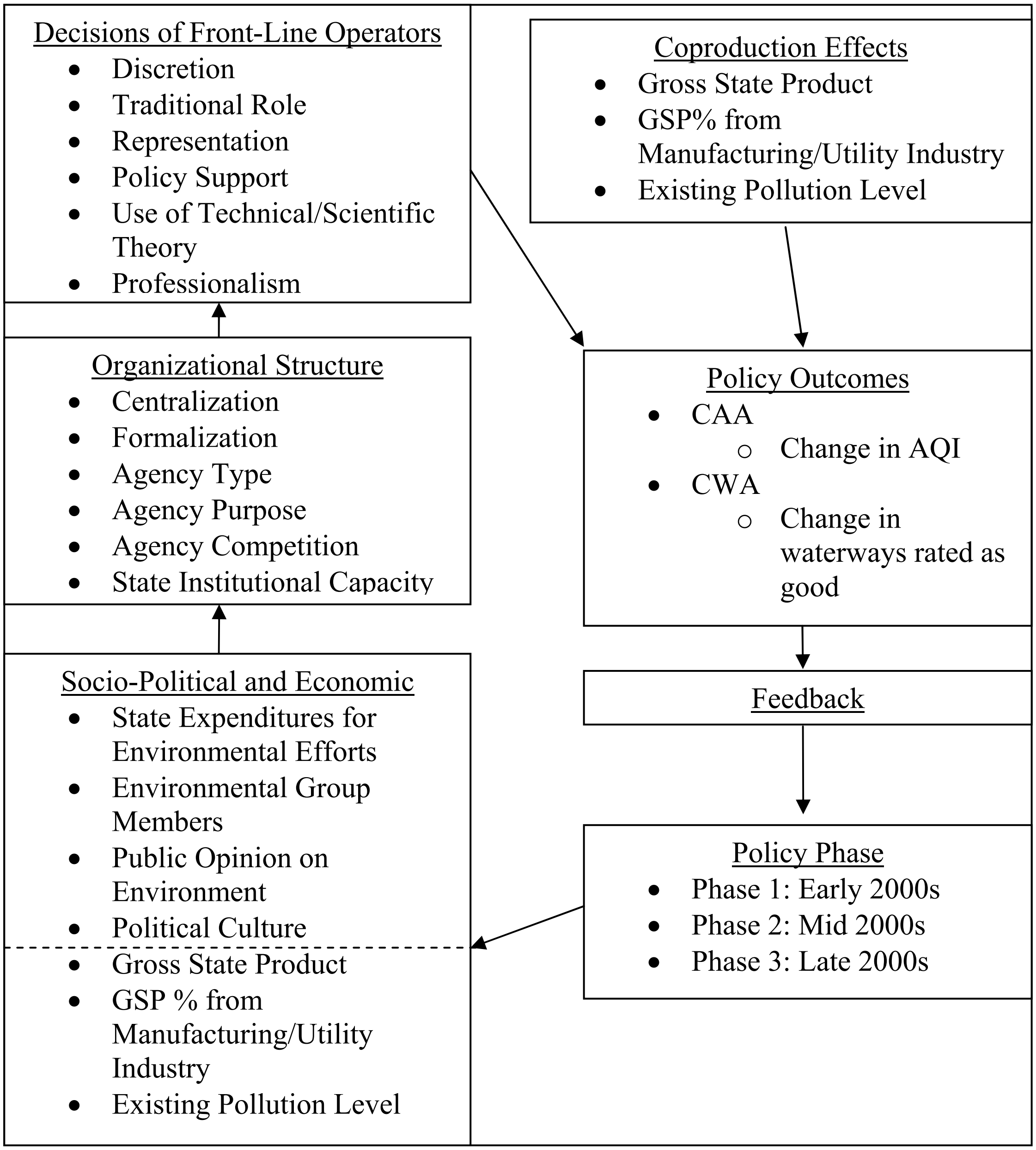

Figure 6.2

CAA and CWA Implementation Framework

First, policy phases were identified based on two criteria: 1) the estimated time it would take for an implementation approach to effect environmental indicators; and 2) the amount of time it would take for policy-makers, other political actors, and implementers to compile this data and become aware of the impact of their implementation approach on policy outcomes.

Second, the political, economic, and social characteristics were identified based on the existing state politics literature (see Chapter 3). Many variables have been included in previous studies, but variables were identified based on those that would effectively capture the general political context relative to environmental policy and those most commonly used. These variables are divided into socio-political variables and economic variables. The socio-political variables are assumed to maintain an indirect relationship with policy outcomes. While economic variables function on this level, they are assumed to have an indirect influence on policy outcomes, as measures of the socio-economic conditions of the state. These will be referred to as the indirect economic effects. These are the only variables in the model that will be tested at more than one level of the model, as will be discussed in the next chapter.

Third, organizational characteristics were chosen based on the factors the existing literature recognize as most likely to affect performance outcomes and the identifiable differences between state level environmental agencies (see Chapter 4). Fourth, implementation characteristics were identified based on the existing implementation models that recognize micro-level implementers as effecting policy outcomes (e.g., Van Meter and Van Horn, 1975 and Lipsky, 1980), as well as those who identify concepts which may affect bureaucratic decision making (e.g., Sabatier and Mazmanian, 1980). Finally, coproduction effects are included to account for factors outside of the implementation process which impact policy outcomes. These are measures of the economic processes, which are the primary contributors to environmental pollution. It is by coincidence that the measures of coproduction effects and of socio-economic conditions are one in the same. This would not hold true with other policy areas. In modeling the coproduction effects, the economic variables are considered to have a direct relationship with policy outcomes. These will be referred to as the direct economic effects, or the coproduction effects.

Implementer decision-making has not been a tested variable in most implementation models, so the variable selection is more limited (see Chapter 5). Finally, the dependent variables were identified based on the statutory requirements relative to the CAA and CWA, and those measures of air and water quality that fulfill the desired criteria outlined in Chapter 2. These variables represent the best approximation for the capture of the concepts outlined in the general implementation framework as they relate to environmental policy, the CAA, and the CWA.

CHAPTER 7

METHODOLOGY

The intent of this chapter is to present the research methodology. First, the research design and analysis approach will be discussed. A hierarchical linear regression model has been chosen based on the theoretical relationship between variables operating at different levels of the implementation process. The background and issues of hierarchical linear regression modeling is presented, followed by an application of these issues to the specific analysis here. Second, the selection, measurement, and organization of the dependent and independent variables will be established. The dependent variables are measures of air and water quality and are organized along those dimensions. The independent variables are organized along the dimension of its position in the theoretical model. Finally, the survey methodology for collecting the data will be presented as a component of the research approach. The specification of variables is a key component to testing the relationship between policy outcomes and implementation, organization, and contextual variables.

Hierarchical Linear Models: Background and Issues

Choosing an analytical technique to properly test the theoretical framework is a key component of developing accurate and precise results. While there have been many methodological approaches previously employed to test implementation frameworks, the choice of analytical technique should be driven by theory. The most important characteristic of the implementation model that should be incorporated is the use of multi-level effects on outcomes. Implementation scholars tend to theorize at multiple levels (Van Meter and Van, 1975; Sabatier and Mazmanian, 1980), but test these theories with single level models (Lester and Bowman, 1989). Analyzing multi-level data at the single level creates the obvious weakness of assuming independent variables that are theoretically at different levels are impacting dependent variables at the same level. Additionally, doing so creates problems by either discarding meaningful variation in lower level data through aggregation to the highest level, or violating basic statistical assumptions of independence by disaggregating to the lowest level (Hofmann, 1997). The need for HLM is driven by a simple observation: “It is clear that variables at one hierarchical level can influence variables at another hierarchical level. In fact, numerous theoretical discussions and empirical investigations have identified relationships between variables that reside at different levels” (Hofmann, 1997, p. 724). HLM has most prominently been used in educational research (Burstein, 1980; Bryk and Raudenbush, 1988; Raudenbush, 1988; Lee, 2000); however, many scholars are finding effective uses for organizational and management analysis as well (Mossholder and Bedeian, 1983; Klein and Kozlowski, 2000; Gavin and Hofmann, 2002; Zhang, Zyphur, and Preacher, 2009). Furthermore, O’Toole (2000) has expressly called for the use of hierarchical linear modeling (HLM) in implementation research, pointing to the success of performance outcome analyses by Heinrich and Lynn (2000) and Roderick (2000).

HLM in its simplest form is an extension of ordinary least squares (OLS) regression modeling. HLM incorporates two models: one that models the relationship within each group at the lower levels, and a second that models the variation between groups at each level. As a result, relationships are modeled for each group at each level. At Level-1, the equation mirrors a simple OLS regression equation:

$$Y_{\iota\alpha}=\beta_{0\alpha} + \beta_{1\alpha} X_{\iota\alpha} + r_{\iota\alpha} \qquad (7.1)$$

where $\gamma_{\iota\alpha}$ is the outcome for individual ι in group α, $X_{\iota\alpha}$ is the value of the predictor individual ι in group α, $\beta_{0\alpha}$ and $\beta_{1\alpha}$are the intercepts and slopes estimated separately for each group, and $r_{\iota\alpha}$ is the residual. However, since the relationships are estimated for each group separately, the slopes and intercepts can either be stable or vary across groups. Thus, four patterns emerge: shared slopes and intercepts between all groups; shared slopes but different intercepts between groups; shared intercepts but different slopes between groups; or different slopes and intercepts between groups. The difference between slopes and intercepts between groups leads to the question of whether these variations are the result of Level-2 variables (Bryk and Raudenbush, 1992; Hofmann, 1997; Raudenbush and Bryk, 2002; Bickel, 2007).

Thus, at Level-2, the regression model uses the slopes and intercepts of the Level-1 model as dependent variables, and the Level-2 variables as the independent variables. In simpler terms, the Level-2 variables are used to predict the differences in the relationships between Level-1 variables and outcomes. At Level-2, the equation takes on a more complex form:

$$\beta_{0\alpha}= \gamma_{00}+ \gamma_{01} G_{\alpha}+ U_{0\alpha} \qquad (7.2)$$

$$\beta_{1\alpha}= \gamma_{10}+ \gamma_{11} G_{\alpha}+ U_{1\alpha}$$

where $\beta_{0\alpha}$ and $\beta_{1\alpha}$are the intercepts and slopes estimated separately for each group from Level-1 and serve as the dependent variables, G_{α} is a group level variable, γ_{00} and γ_{10} are the second stage intercept terms, γ_{01} and γ_{11} are the slopes relating G_{α} to the intercept and slope terms from the Level-1 equation, and $U_{0\alpha}$ and $U_{1\alpha}$ are the Level-2 residuals. However, the equations must be adjusted based on the patterns of variance for the slope and intercepts from Level-1. For example, in situations where there is no variance in intercepts the group level variable (G_{α}) is not meaningful in predicting the intercepts at Level-1, since all groups have similar intercepts. This pattern is continued with each additional level of analysis added to the model. Undoubtedly, each additional level of the hierarchical model adds exponentially to the complexity of the analysis (Bryk and Raudenbush, 1992; Hofmann, 1997; Raudenbush and Bryk, 2002; Bickel, 2007).

HLM models incorporate both fixed and random coefficient components in estimating effects. At the highest level, effects are not assumed to vary across groups so a fixed effects estimate is utilized, which is akin to the estimations used in a basic single level OLS regression model. However, the precision of the Level-1 parameters requires a generalized least squares (GLS) estimate rather than an OLS estimate (Bryk and Raudenbush, 1992; Hofmann, 1997; Raudenbush and Bryk, 2002; Bickel, 2007). For our purposes, the difference is not overwhelmingly important, but it should be noted.

HLM models begin to make an important departure from OLS models during the estimation of lower level coefficients, due to the assumption of random effects rather than fixed effects. At lower levels, coefficients are the results of two separate calculations based on: 1) the basic OLS regression equation; and 2) the regression equations using the slope and intercept of the lower level as dependent variables. First, coefficients for

Level-1 variables can easily be estimated by using the outcome variables as the dependent variables and the Level-1 variables as independent variables. Second, as Level-1 variables also serve as dependent variables for Level-2 independent variables, there must be a second estimation of these effects. Therefore, there are two coefficient estimates for each group at Level-1 (Bryk and Raudenbush, 1992; Hofmann, 1997; Raudenbush and Bryk, 2002).

However, two coefficients create confusion in identifying the most accurate relationship estimate. To create a single coefficient, a Bayes estimation strategy is used to calculate a weighting strategy for the two coefficient estimations. The Bayes estimates create weights based on the reliability of the OLS estimates, which is a determination of the systematic variance between groups (Bryk and Raudenbush, 1992; Hofmann, 1997; Raudenbush and Bryk, 2002). Using the Bayes estimation, "an estimation of the level-1 intercepts and slopes for each unit [is calculated] which optimally weights the OLS level-1 estimates and the level-2 predicted values for these same estimates" (Hofmann, 1997, p. 731). This method produces a smaller mean square error term than the equations using Level-1 variables as either an independent or dependent variable, resulting in the most accurate estimation of coefficients (Raudenbush, 1988).

In sum, at the highest level, there is a single estimation of coefficients in a relatively straightforward method that does not deviate significantly from the basic regression approach. At lower levels, predictor variables are tested as both dependent (from the higher level predictor variables) and independent variables (to outcome variables), with estimations of coefficients resulting from both calculations. The calculations are then weighted based on reliability to produce coefficient estimations with the smallest error term.

The statistical assumptions of HLM are comparable to that of OLS; however, they differ slightly due to the use of multiple levels of analysis. First, at each level, linearity is assumed. Second, at Level-1 residuals are assumed to have a normal distribution. Third, Level-1 residuals are assumed to be constant and independent from Level-1 predictors. Fourth, at Level-2, random errors are assumed to have a multivariate normal distribution, and residuals are assumed to be uncorrelated. Fifth, independence of observations is only assumed at the highest level (Hofmann, 1997; Bickel, 2007; ATS, 2012). HLM does not assume that observations nested within groups are independent of each other, and controls for clustering of observations and heteroskedasticity as a result (Hofmann, 1997; Chaplin, 2003; ATS, 2012). While these assumptions are akin to OLS assumptions, they are more flexible; nevertheless, when violated HLM will still produce a best fit models similar to the Best Linear Unbiased Estimate property for an OLS model (Chaplin, 2003).

Finally, there remain two important issues HLM regression that should be noted: sampling and centering. First, due to the assumed lack of independence between observations at the lower levels, sample sizes differ between levels of analysis. There will undoubtedly be a varying number of observations within groups across each level. Therefore, there will be a varying degree of substantive and statistical significance between groups. HLM accounts for this in its estimation of the coefficients, so uniformity in n-sizes and difference in strength of regression relationships are not an issue of concern (Hofmann, 1997; Raudenbush and Bryk, 2002; Bickel, 2007). The more controversial issue, though, is what n-size constitutes an appropriate sample size. A rule of thumb has been established at 30 groups with 30 individuals in each (Hofmann, 1997; Bickel, 2007); although, other sources contend 20 groups with 30 individuals in each is appropriate (Bickel, 2007). Power in estimation is effecting by two different components at each level: the number of groups, and the total number of observations. At Level-1, power is affected by the total number of observations, similar to the estimation of an OLS model. However, at Level-2, power is affected by the number of groups, not the number of observations within each group (Hofmann, 1997; Bickel, 2007). Hofmann (1997) suggests the same power is gained with 30 groups of 30 individuals as 150 groups of 5 individuals. Therefore, there is an important tradeoff between the number of groups and the total number of observations (Hofmann, 1997). For the research here, there are a finite and unchangeable number of states and environmental agencies within those states. Thus, the number of groups is beyond control. This is the most important aspect constraining this analysis, and will be discussed in detail below with the specific application of the HLM model to this analysis.

Second, centering is the rescaling of Level-1 predictors. The interpretation of the intercept parameter is based on holding all other parameters at zero. However, for most concepts measured in organizational research, zero has essentially no meaning (i.e., centralization). Therefore, centering involves rescaling Level-1 predictors to make zero a meaningful measurement (Hofmann, 1997; Hofmann and Gavin, 1998; Bickel, 2007). There are three primary options: 1) using the raw scores without centering, which does not affect interpretation of the intercept parameter; 2) subtracting the grand mean from each individual's score on the predictor, which results in interpreting the intercept parameter as representing that of the average level on the predictor; and 3) subtracting the group mean from each individual's score on the predictor, which results in interpreting the intercept parameter as representing the average level for the group (Hofmann, 1997; Hofmann and Gavin, 1998). While centering options are not statistically equivalent, the choice should be driven by theory (Hofmann and Gavin, 1998). Hofmann (1997) argues: "In summary, the choice of centering options goes well beyond simply the interpretation of the intercept term. A researcher must primarily consider their overarching theoretical paradigm and from that discern what centering option best represents their paradigm" (p. 738). Hofmann and Gavin (1998) identify four paradigms on which to base centering decisions: incremental, in which group level variables directly affect individual level variables; meditational, in which group level variables only indirectly affect individual level variables through mediating mechanisms; moderational, in which group level variables serve as a moderator between two individual level variables; and, separate, in which different structural models for within-group and between-group components are proposed. Centering is a component tied to the basic theoretical assumptions being made about the data.

Two-Level Model for CAA and CWA Implementation

Developing the statistical model to match the theoretical model is a difficult task. The theoretical model includes five components (not including feedback) operating at different levels. The difficulty comes with trying to capture these five components within the statistical model, not in specifying the variables which will be addressed below. The first, policy outcomes, is clearly the dependent variable of the model, as predicting the outcomes of the CAA and CWA is main focus of this analysis.

The next three components (decisions by front-line operators, organizational variables, and state-level conditions) of the theoretical model are to be captured within the hierarchical levels of the statistical model. First, the state-level conditions can be identified as the highest-level of analysis, as they capture the environment of policy implementation at the largest scale. Second, the decisions of front-line operators can be identified as the lowest level in the hierarchical model. Much theoretical emphasis has been placed on the direct role between implementer decisions and policy outcomes. However, it is the third component that presents the problem. The constraints presented by sample size are a major challenge. There is a limited amount of states and organizations nested within those states. For the majority of states, only a single organization is operated for the protection of air and water quality. To achieve statistical significance based on the recommendations from the literature (Hofmann, 1997; Bickel, 2007), either more than 20 new environmental agencies per state would have to be created or more than 100 new states each with their own environmental agencies would have to be created. Therefore, the sample size criteria to achieve statistically significant results cannot be met by nesting the organizational level within the state level. While organizational variables have been theorized to operate a distinct level from state-level conditions and decisions of front-line operators, creating a statistical model that is true to this would most likely produce statistically insignificant results. Thus, the organizational variables must be combined with the state-level conditions or the decisions of front-line operators at the appropriate level to achieve a statistically significant sample size. Combining three theoretical components into two levels of analysis cannot be done lightly. Clearly, the result will be one level with one component and one level with two components. There are two important questions to consider: 1) which two components are most akin to each other?; and 2) which is the most theoretically important component for the model? The first question leaves no clear answer as organizational variables are related to both state-level conditions and the decisions of front-line operators. However, the answer to the second question presents a more clear choice. The theoretical model places an emphasis on the decisions of front-line operators in effecting policy outcomes. The organizational and state-level variables set the context for the decisions of front-line operators. Therefore, to properly test these hypotheses, the decisions of front-line operators must be tested at its own level.

Consequently, that leaves the decisions of front-line operators as Level-1 of the analysis, and state-level conditions and organizational variables as Level-2 of the analysis. One additional issue remains, however: whether the organizational variables should be aggregated to the state-level or state-level conditions disaggregated to the organizational level. HLM only assumes a lack of independence of observations at the lower levels of analysis, not at the highest level. While aggregating data to the state-level will result in a potential loss of meaningful variation, disaggregation would result in a violation of that assumption and potential autocorrelation errors. Clearly, disaggregation presents the bigger issue. Therefore, the Level-2 analysis will include state-level conditions and organizational variables which will be aggregated to the state-level. There are two versions of the full two-level models that will be tested for air quality, one set with direct economic effects (Model A.1) and one set with indirect economic effects (Model A.2). Additionally, there are two nested models presented which only include the statistically significant predictors from Model A.1 and Model A.2; Model A.3 will include direct economic effects and Model A.4, indirect economic effects. For water quality, only a full model with indirect economic effects (Model W.1) will be tested. Due to insufficient data, a model with direct economic effects cannot be properly specified. The state self-assessed CWA reports include missing data on water quality outcomes for some states, which reduces both the number of groups at Level-2 and total observations at Level-1. Furthermore, the data requirements for HLM are impacted by the number of effects at both levels of the model. The additional control variables necessary in the water quality models means the available data is not sufficient to test the economic variables at Level-1. Additionally, a nested model will be presented, including only the statistically significant predictors and the control variables. The Level-1 equations are presented in Table 7.1; the Level-2 equations, Table 7.2. Level-1 equations are numbered based on models; Level-2 equations, based on models and the Level-1 predictor serving as the dependent variable. For the sake of brevity, symbols used in the equations are all described in Table 7.3, with the descriptions applicable through all equations.

Note the Level-2 equations are identical with the exception of those for POLLUTION, GSP, and GSP%UM for Model A.1 and A.3, and for TOTAL_WATER and LAMBDA in Model W.1 and W.2. The Level-2 equations are used to predict the Level-1 variables, and for all other variables the same predictor variables can be used; however, these five variables are different. The organizational characteristics of environmental agencies cannot predict gross state product, nor the total mileage of state waterways. These variables are statistically important to be included at Level-1, but the Level-2 equations must be adjusted. Thus, a different set of Level-2 predictors had to be utilized in the Level-2 equations for these Level-1 predictors. For POLLUTION, GSP, and GSP%UM only the policy phase variables are used as Level-2 predictors; for TOTAL_WATER, no predictor variables are used; and, for LAMBDA, only ENV_EXRT and ASSESS_WATER are used.

Table 7.1

Level – 1 Equations

$$Y_{air} = \beta_0 + \beta_1 KNOWLEDGE + \beta_2 SUPPORT + \beta_3 DISCRETION + \beta_4 TRADITION + \beta_5 REPRESENT + \beta_6 PROFESSIONAL + \beta_7 POLLUTION + \beta_8 GSP + \beta_9 GSP\%UM + r \quad \text{(A.1)}$$

$$Y_{air} = \beta_0 + \beta_1 KNOWLEDGE + \beta_2 SUPPORT + \beta_3 DISCRETION + \beta_4 TRADITION + \beta_5 REPRESENT + \beta_6 PROFESSIONAL + r \quad \text{(A.2)}$$

$$Y_{air} = \beta_0 + \beta_1 KNOWLEDGE + \beta_2 DISCRETION + \beta_3 REPRESENT + \beta_4 PROFESSIONAL + \beta_5 POLLUTION + \beta_6 GSP + \beta_7 GSP\%UM + r \quad \text{(A.3)}$$

$$Y_{air} = \beta_0 + \beta_1 KNOWLEDGE + \beta_2 SUPPORT + \beta_3 DISCRETION + \beta_4 REPRESENT + r \quad \text{(A.4)}$$

$$Y_{water} = \beta_0 + \beta_1 KNOWLEDGE + \beta_2 SUPPORT + \beta_3 DISCRETION + \beta_4 TRADITION + \beta_5 REPRESENT + \beta_6 PROFESSIONAL + \beta_7 ASSESS\_WATER + \beta_8 TOTAL\_WATER + \beta_9 LAMBDA + r \quad \text{(W.1)}$$

$$Y_{water} = \beta_0 + \beta_1 SUPPORT + \beta_2 DISCRETION + \beta_3 TRADITION + \beta_4 PROFESSIONAL + \beta_5 ASSESS\_WATER + \beta_6 TOTAL\_WATER + \beta_7 LAMBDA + r \quad \text{(W.2)}$$

Table 7.2

Level-2 Equations for Model A.1

$$\beta_0 = \gamma_{00} + \gamma_{01}PHASE\_1 + \gamma_{02}PHASE\_2 + \gamma_{03}CENTRAL + \gamma_{04}FORMAL + \gamma_{05}CRAFT + \gamma_{06}PROCEDURAL + \gamma_{07}PRODUCTION + \gamma_{08}PURPOSE + \gamma_{09}COMEPTITION + \gamma_{010}CAPACITY + \gamma_{011}ENV\_EXP + \gamma_{012}SIERRA + \gamma_{013}PUBLIC\_OP + \gamma_{014}INDIVIDUAL + \gamma_{015}MORAL + U \quad \text{(A.1.0)}$$

$$\beta_1 = \gamma_{00} + \gamma_{01}PHASE\_1 + \gamma_{02}PHASE\_2 + \gamma_{03}CENTRAL + \gamma_{04}FORMAL + \gamma_{05}CRAFT + \gamma_{06}PROCEDURAL + \gamma_{07}PRODUCTION + \gamma_{08}PURPOSE + \gamma_{09}COMEPTITION + \gamma_{010}CAPACITY + \gamma_{011}ENV\_EXP + \gamma_{012}SIERRA + \gamma_{013}PUBLIC\_OP + \gamma_{014}INDIVIDUAL + \gamma_{015}MORAL + U \quad \text{(A.1.1)}$$

$$\beta_2 = \gamma_{00} + \gamma_{01}PHASE\_1 + \gamma_{02}PHASE\_2 + \gamma_{03}CENTRAL + \gamma_{04}FORMAL + \gamma_{05}CRAFT + \gamma_{06}PROCEDURAL + \gamma_{07}PRODUCTION + \gamma_{08}PURPOSE + \gamma_{09}COMEPTITION + \gamma_{010}CAPACITY + \gamma_{011}ENV\_EXP + \gamma_{012}SIERRA + \gamma_{013}PUBLIC\_OP + \gamma_{014}INDIVIDUAL + \gamma_{015}MORAL + U \quad \text{(A.1.2)}$$

$$\beta_3 = \gamma_{00} + \gamma_{01}PHASE\_1 + \gamma_{02}PHASE\_2 + \gamma_{03}CENTRAL + \gamma_{04}FORMAL + \gamma_{05}CRAFT + \gamma_{06}PROCEDURAL + \gamma_{07}PRODUCTION + \gamma_{08}PURPOSE + \gamma_{09}COMEPTITION + \gamma_{010}CAPACITY + \gamma_{011}ENV\_EXP + \gamma_{012}SIERRA + \gamma_{013}PUBLIC\_OP + \gamma_{014}INDIVIDUAL + \gamma_{015}MORAL + U \quad \text{(A.1.3)}$$

$$\beta_4 = \gamma_{00} + \gamma_{01}PHASE\_1 + \gamma_{02}PHASE\_2 + \gamma_{03}CENTRAL + \gamma_{04}FORMAL + \gamma_{05}CRAFT + \gamma_{06}PROCEDURAL + \gamma_{07}PRODUCTION + \gamma_{08}PURPOSE + \gamma_{09}COMEPTITION + \gamma_{010}CAPACITY + \gamma_{011}ENV\_EXP + \gamma_{012}SIERRA + \gamma_{013}PUBLIC\_OP + \gamma_{014}INDIVIDUAL + \gamma_{015}MORAL + U \quad \text{(A.1.4)}$$

$$\beta_5 = \gamma_{00} + \gamma_{01}PHASE\_1 + \gamma_{02}PHASE\_2 + \gamma_{03}CENTRAL + \gamma_{04}FORMAL + \gamma_{05}CRAFT + \gamma_{06}PROCEDURAL + \gamma_{07}PRODUCTION + \gamma_{08}PURPOSE + \gamma_{09}COMEPTITION + \gamma_{010}CAPACITY + \gamma_{011}ENV\_EXP + \gamma_{012}SIERRA + \gamma_{013}PUBLIC\_OP + \gamma_{014}INDIVIDUAL + \gamma_{015}MORAL + U \quad \text{(A.1.5)}$$

$$\beta_6 = \gamma_{00} + \gamma_{01}PHASE\_1 + \gamma_{02}PHASE\_2 + \gamma_{03}CENTRAL + \gamma_{04}FORMAL + \gamma_{05}CRAFT + \gamma_{06}PROCEDURAL + \gamma_{07}PRODUCTION + \gamma_{08}PURPOSE + \gamma_{09}COMEPTITION + \gamma_{010}CAPACITY + \gamma_{011}ENV\_EXP + \gamma_{012}SIERRA + \gamma_{013}PUBLIC\_OP + \gamma_{014}INDIVIDUAL + \gamma_{015}MORAL + U \quad \text{(A.1.6)}$$

$$\beta_7 = \gamma_{00} + \gamma_{01}PHASE\_1 + \gamma_{02}PHASE\_2 + U \quad \text{(A.1.7)}$$

$$\beta_8 = \gamma_{00} + \gamma_{01}PHASE\_1 + \gamma_{02}PHASE\_2 + U \quad \text{(A.1.8)}$$

$$\beta_9 = \gamma_{00} + \gamma_{01}PHASE\_1 + \gamma_{02}PHASE\_2 + U \quad \text{(A.1.9)}$$

Table 7.3

Level-2 Equations for Model A.2

$$\beta_0 = \gamma_{00} + \gamma_{01}PHASE_1 + \gamma_{02}PHASE_2 + \gamma_{03}CENTRAL + \gamma_{04}FORMAL + \gamma_{05}CRAFT + \gamma_{06}PROCEDURAL + \gamma_{07}PRODUCTION + \gamma_{08}PURPOSE + \gamma_{09}COMEPTITION + \gamma_{010}CAPACITY + \gamma_{011}ENV_{EXP} + \gamma_{012}SIERRA + \gamma_{013}PUBLIC_{OP} + \gamma_{014}INDIVIDUAL + \gamma_{015}MORAL + \gamma_{016}GSP + \gamma_{017}GSP\%UM + \gamma_{018}POLLUTION + U \quad \text{(A.2.0)}$$

$$\beta_1 = \gamma_{00} + \gamma_{01}PHASE\_1 + \gamma_{02}PHASE\_2 + \gamma_{03}CENTRAL + \gamma_{04}FORMAL + \gamma_{05}CRAFT + \gamma_{06}PROCEDURAL + \gamma_{07}PRODUCTION + \gamma_{08}PURPOSE + \gamma_{09}COMEPTITION + \gamma_{010}CAPACITY + \gamma_{011}ENV\_EXP + \gamma_{012}SIERRA + \gamma_{013}PUBLIC\_OP + \gamma_{014}INDIVIDUAL + \gamma_{015}MORAL + \gamma_{016}GSP + \gamma_{017}GSP\%UM + \gamma_{018}POLLUTION + U \quad \text{(A.2.1)}$$

$$\beta_2 = \gamma_{00} + \gamma_{01}PHASE\_1 + \gamma_{02}PHASE\_2 + \gamma_{03}CENTRAL + \gamma_{04}FORMAL + \gamma_{05}CRAFT + \gamma_{06}PROCEDURAL + \gamma_{07}PRODUCTION + \gamma_{08}PURPOSE + \gamma_{09}COMEPTITION + \gamma_{010}CAPACITY + \gamma_{011}ENV\_EXP + \gamma_{012}SIERRA + \gamma_{013}PUBLIC\_OP + \gamma_{014}INDIVIDUAL + \gamma_{015}MORAL + \gamma_{016}GSP + \gamma_{017}GSP\%UM + \gamma_{018}POLLUTION + U \quad \text{(A.2.2)}$$

$$\beta_3 = \gamma_{00} + \gamma_{01}PHASE\_1 + \gamma_{02}PHASE\_2 + \gamma_{03}CENTRAL + \gamma_{04}FORMAL + \gamma_{05}CRAFT + \gamma_{06}PROCEDURAL + \gamma_{07}PRODUCTION + \gamma_{08}PURPOSE + \gamma_{09}COMEPTITION + \gamma_{010}CAPACITY + \gamma_{011}ENV\_EXP + \gamma_{012}SIERRA + \gamma_{013}PUBLIC\_OP + \gamma_{014}INDIVIDUAL + \gamma_{015}MORAL + \gamma_{016}GSP + \gamma_{017}GSP\%UM + \gamma_{018}POLLUTION + U \quad \text{(A.2.3)}$$

$$\beta_4 = \gamma_{00} + \gamma_{01}PHASE\_1 + \gamma_{02}PHASE\_2 + \gamma_{03}CENTRAL + \gamma_{04}FORMAL + \gamma_{05}CRAFT + \gamma_{06}PROCEDURAL + \gamma_{07}PRODUCTION + \gamma_{08}PURPOSE + \gamma_{09}COMEPTITION + \gamma_{010}CAPACITY + \gamma_{011}ENV\_EXP + \gamma_{012}SIERRA + \gamma_{013}PUBLIC\_OP + \gamma_{014}INDIVIDUAL + \gamma_{015}MORAL + \gamma_{016}GSP + \gamma_{017}GSP\%UM + \gamma_{018}POLLUTION + U \quad \text{(A.2.4)}$$

$$\beta_5 = \gamma_{00} + \gamma_{01}PHASE\_1 + \gamma_{02}PHASE\_2 + \gamma_{03}CENTRAL + \gamma_{04}FORMAL + \gamma_{05}CRAFT + \gamma_{06}PROCEDURAL + \gamma_{07}PRODUCTION + \gamma_{08}PURPOSE + \gamma_{09}COMEPTITION + \gamma_{010}CAPACITY + \gamma_{011}ENV\_EXP + \gamma_{012}SIERRA + \gamma_{013}PUBLIC\_OP + \gamma_{014}INDIVIDUAL + \gamma_{015}MORAL + \gamma_{016}GSP + \gamma_{017}GSP\%UM + \gamma_{018}POLLUTION + U \quad \text{(A.2.5)}$$

$$\beta_6 = \gamma_{00} + \gamma_{01}PHASE\_1 + \gamma_{02}PHASE\_2 + \gamma_{03}CENTRAL + \gamma_{04}FORMAL + \gamma_{05}CRAFT + \gamma_{06}PROCEDURAL + \gamma_{07}PRODUCTION + \gamma_{08}PURPOSE + \gamma_{09}COMEPTITION + \gamma_{010}CAPACITY + \gamma_{011}ENV\_EXP + \gamma_{012}SIERRA + \gamma_{013}PUBLIC\_OP + \gamma_{014}INDIVIDUAL + \gamma_{015}MORAL + \gamma_{016}GSP + \gamma_{017}GSP\%UM + \gamma_{018}POLLUTION + \quad \text{(A.2.6)}$$

Table 7.4

Level-2 Equations for Model A.3

$$\beta_0 = \gamma_{00} + \gamma_{01}PHASE\_1 + \gamma_{02}PHASE\_2 + \gamma_{03}CENTRAL + \gamma_{05}CRAFT + \gamma_{06}PROCEDURAL + \gamma_{07}PRODUCTION + \gamma_{08}PURPOSE + \gamma_{010}CAPACITY + \gamma_{011}ENV\_EXP + \gamma_{012}SIERRA + \gamma_{013}PUBLIC\_OP + \gamma_{014}INDIVIDUAL + \gamma_{015}MORAL + U \quad \text{(A.3.0)}$$

$$\beta_1 = \gamma_{00} + \gamma_{01}PHASE\_1 + \gamma_{02}PHASE\_2 + \gamma_{03}CENTRAL + \gamma_{05}CRAFT + \gamma_{06}PROCEDURAL + \gamma_{07}PRODUCTION + \gamma_{08}PURPOSE + +\gamma_{010}CAPACITY + \gamma_{011}ENV\_EXP + \gamma_{012}SIERRA + \gamma_{013}PUBLIC\_OP + \gamma_{014}INDIVIDUAL + \gamma_{015}MORAL + U \quad \text{(A.3.1)}$$

$$\beta_2 = \gamma_{00} + \gamma_{01}PHASE\_1 + \gamma_{02}PHASE\_2 + \gamma_{03}CENTRAL + \gamma_{05}CRAFT + \gamma_{06}PROCEDURAL + \gamma_{07}PRODUCTION + \gamma_{08}PURPOSE + \gamma_{010}CAPACITY + \gamma_{011}ENV\_EXP + \gamma_{012}SIERRA + \gamma_{013}PUBLIC\_OP + \gamma_{014}INDIVIDUAL + \gamma_{015}MORAL + U \quad \text{(A.3.2)}$$

$$\beta_3 = \gamma_{00} + \gamma_{01}PHASE\_1 + \gamma_{02}PHASE\_2 + \gamma_{03}CENTRAL + \gamma_{05}CRAFT + \gamma_{06}PROCEDURAL + \gamma_{07}PRODUCTION + \gamma_{08}PURPOSE + \gamma_{010}CAPACITY + \gamma_{011}ENV\_EXP + \gamma_{012}SIERRA + \gamma_{013}PUBLIC\_OP + \gamma_{014}INDIVIDUAL + \gamma_{015}MORAL + U \quad \text{(A.3.3)}$$

$$\beta_4 = \gamma_{00} + \gamma_{01}PHASE\_1 + \gamma_{02}PHASE\_2 + \gamma_{03}CENTRAL + \gamma_{05}CRAFT + \gamma_{06}PROCEDURAL + \gamma_{07}PRODUCTION + \gamma_{08}PURPOSE + \gamma_{010}CAPACITY + \gamma_{011}ENV\_EXP + \gamma_{012}SIERRA + \gamma_{013}PUBLIC\_OP + \gamma_{014}INDIVIDUAL + \gamma_{015}MORAL + U \quad \text{(A.3.4)}$$

$$\beta_5 = \gamma_{00} + \gamma_{01}PHASE\_1 + \gamma_{02}PHASE\_2 + U \quad \text{(A.3.5)}$$

$$\beta_6 = \gamma_{00} + \gamma_{01}PHASE\_1 + \gamma_{02}PHASE\_2 + U \quad \text{(A.3.6)}$$

$$\beta_7 = \gamma_{00} + \gamma_{01}PHASE\_1 + \gamma_{02}PHASE\_2 + U \quad \text{(A.3.7)}$$

Table 7.5

Level-2 Equations for Model A.4

$$\beta_0 = \gamma_{00} + \gamma_{01}PHASE_1 + \gamma_{02}PHASE_2 + \gamma_{03}CENTRAL + \gamma_{04}FORMAL + \gamma_{05}CRAFT + \gamma_{06}PROCEDURAL + \gamma_{07}PRODUCTION + \gamma_{08}PURPOSE + \gamma_{09}COMEPTITION + \gamma_{010}CAPACITY + \gamma_{011}ENV_{EXP} + \gamma_{012}SIERRA + \gamma_{013}PUBLIC_{OP} + \gamma_{014}INDIVIDUAL + \gamma_{015}MORAL + \gamma_{016}GSP + \gamma_{017}GSP\%UM + \gamma_{018}POLLUTION + U \quad \text{(A.4.0)}$$

$$\beta_1 = \gamma_{00} + \gamma_{01}PHASE\_1 + \gamma_{02}PHASE\_2 + \gamma_{03}CENTRAL + \gamma_{04}FORMAL + \gamma_{05}CRAFT + \gamma_{06}PROCEDURAL + \gamma_{07}PRODUCTION + \gamma_{08}PURPOSE + \gamma_{09}COMEPTITION + \gamma_{010}CAPACITY + \gamma_{011}ENV\_EXP + \gamma_{012}SIERRA + \gamma_{013}PUBLIC\_OP + \gamma_{014}INDIVIDUAL + \gamma_{015}MORAL + \gamma_{016}GSP + \gamma_{017}GSP\%UM + \gamma_{018}POLLUTION + U \quad \text{(A.4.1)}$$

$$\beta_2 = \gamma_{00} + \gamma_{01}PHASE\_1 + \gamma_{02}PHASE\_2 + \gamma_{03}CENTRAL + \gamma_{04}FORMAL + \gamma_{05}CRAFT + \gamma_{06}PROCEDURAL + \gamma_{07}PRODUCTION + \gamma_{08}PURPOSE + \gamma_{09}COMEPTITION + \gamma_{010}CAPACITY + \gamma_{011}ENV\_EXP + \gamma_{012}SIERRA + \gamma_{013}PUBLIC\_OP + \gamma_{014}INDIVIDUAL + \gamma_{015}MORAL + \gamma_{016}GSP + \gamma_{017}GSP\%UM + \gamma_{018}POLLUTION + U \quad \text{(A.4.2)}$$

$$\beta_3 = \gamma_{00} + \gamma_{01}PHASE\_1 + \gamma_{02}PHASE\_2 + \gamma_{03}CENTRAL + \gamma_{04}FORMAL + \gamma_{05}CRAFT + \gamma_{06}PROCEDURAL + \gamma_{07}PRODUCTION + \gamma_{08}PURPOSE + \gamma_{09}COMEPTITION + \gamma_{010}CAPACITY + \gamma_{011}ENV\_EXP + \gamma_{012}SIERRA + \gamma_{013}PUBLIC\_OP + \gamma_{014}INDIVIDUAL + \gamma_{015}MORAL + \gamma_{016}GSP + \gamma_{017}GSP\%UM + \gamma_{018}POLLUTION + U \quad \text{(A.4.3)}$$

$$\beta_4 = \gamma_{00} + \gamma_{01}PHASE\_1 + \gamma_{02}PHASE\_2 + \gamma_{03}CENTRAL + \gamma_{04}FORMAL + \gamma_{05}CRAFT + \gamma_{06}PROCEDURAL + \gamma_{07}PRODUCTION + \gamma_{08}PURPOSE + \gamma_{09}COMEPTITION + \gamma_{010}CAPACITY + \gamma_{011}ENV\_EXP + \gamma_{012}SIERRA + \gamma_{013}PUBLIC\_OP + \gamma_{014}INDIVIDUAL + \gamma_{015}MORAL + \gamma_{016}GSP + \gamma_{017}GSP\%UM + \gamma_{018}POLLUTION + U \quad \text{(A.4.4)}$$

Table 7.6

Level-2 Equations for Model W.1

$$\begin{aligned}\beta_0 = \gamma_{00} &+ \gamma_{01}PHASE\_1 + \gamma_{02}PHASE\_2 + \gamma_{03}CENTRAL + \gamma_{04}FORMAL \\ &+ \gamma_{05}CRAFT + \gamma_{06}PROCEDURAL + \gamma_{07}PRODUCTION \\ &+ \gamma_{08}PURPOSE + \gamma_{09}COMEPTITION + \gamma_{010}CAPACITY \\ &+ \gamma_{011}ENV\_EXP + \gamma_{012}SIERRA + \gamma_{013}PUBLIC\_OP \\ &+ \gamma_{014}INDIVIDUAL + \gamma_{015}MORAL + U\end{aligned} \quad \text{(W.1.0)}$$

$$\begin{aligned}\beta_1 = \gamma_{00} &+ \gamma_{01}PHASE\_1 + \gamma_{02}PHASE\_2 + \gamma_{03}CENTRAL + \gamma_{04}FORMAL \\ &+ \gamma_{05}CRAFT + \gamma_{06}PROCEDURAL + \gamma_{07}PRODUCTION \\ &+ \gamma_{08}PURPOSE + \gamma_{09}COMEPTITION + \gamma_{010}CAPACITY \\ &+ \gamma_{011}ENV\_EXP + \gamma_{012}SIERRA + \gamma_{013}PUBLIC\_OP \\ &+ \gamma_{014}INDIVIDUAL + \gamma_{015}MORAL + U\end{aligned} \quad \text{(W.1.1)}$$

$$\begin{aligned}\beta_2 = \gamma_{00} &+ \gamma_{01}PHASE\_1 + \gamma_{02}PHASE\_2 + \gamma_{03}CENTRAL + \gamma_{04}FORMAL \\ &+ \gamma_{05}CRAFT + \gamma_{06}PROCEDURAL + \gamma_{07}PRODUCTION \\ &+ \gamma_{08}PURPOSE + \gamma_{09}COMEPTITION + \gamma_{010}CAPACITY \\ &+ \gamma_{011}ENV\_EXP + \gamma_{012}SIERRA + \gamma_{013}PUBLIC\_OP \\ &+ \gamma_{014}INDIVIDUAL + \gamma_{015}MORAL + U\end{aligned} \quad \text{(W.1.2)}$$

$$\begin{aligned}\beta_3 = \gamma_{00} &+ \gamma_{01}PHASE\_1 + \gamma_{02}PHASE\_2 + \gamma_{03}CENTRAL + \gamma_{04}FORMAL \\ &+ \gamma_{05}CRAFT + \gamma_{06}PROCEDURAL + \gamma_{07}PRODUCTION \\ &+ \gamma_{08}PURPOSE + \gamma_{09}COMEPTITION + \gamma_{010}CAPACITY \\ &+ \gamma_{011}ENV\_EXP + \gamma_{012}SIERRA + \gamma_{013}PUBLIC\_OP \\ &+ \gamma_{014}INDIVIDUAL + \gamma_{015}MORAL + U\end{aligned} \quad \text{(W.1.3)}$$

$$\begin{aligned}\beta_4 = \gamma_{00} &+ \gamma_{01}PHASE\_1 + \gamma_{02}PHASE\_2 + \gamma_{03}CENTRAL + \gamma_{04}FORMAL \\ &+ \gamma_{05}CRAFT + \gamma_{06}PROCEDURAL + \gamma_{07}PRODUCTION \\ &+ \gamma_{08}PURPOSE + \gamma_{09}COMEPTITION + \gamma_{010}CAPACITY \\ &+ \gamma_{011}ENV\_EXP + \gamma_{012}SIERRA + \gamma_{013}PUBLIC\_OP \\ &+ \gamma_{014}INDIVIDUAL + \gamma_{015}MORAL + U\end{aligned} \quad \text{(W.1.4)}$$

$$\begin{aligned}\beta_5 = \gamma_{00} &+ \gamma_{01}PHASE\_1 + \gamma_{02}PHASE\_2 + \gamma_{03}CENTRAL + \gamma_{04}FORMAL \\ &+ \gamma_{05}CRAFT + \gamma_{06}PROCEDURAL + \gamma_{07}PRODUCTION \\ &+ \gamma_{08}PURPOSE + \gamma_{09}COMEPTITION + \gamma_{010}CAPACITY \\ &+ \gamma_{011}ENV\_EXP + \gamma_{012}SIERRA + \gamma_{013}PUBLIC\_OP \\ &+ \gamma_{014}INDIVIDUAL + \gamma_{015}MORAL + U\end{aligned} \quad \text{(W.1.5)}$$

$$\begin{aligned}\beta_6 = \gamma_{00} &+ \gamma_{01}PHASE\_1 + \gamma_{02}PHASE\_2 + \gamma_{03}CENTRAL + \gamma_{04}FORMAL \\ &+ \gamma_{05}CRAFT + \gamma_{06}PROCEDURAL + \gamma_{07}PRODUCTION \\ &+ \gamma_{08}PURPOSE + \gamma_{09}COMEPTITION + \gamma_{010}CAPACITY \\ &+ \gamma_{011}ENV\_EXP + \gamma_{012}SIERRA + \gamma_{013}PUBLIC\_OP \\ &+ \gamma_{014}INDIVIDUAL + \gamma_{015}MORAL + U\end{aligned} \quad \text{(W.1.6)}$$

$$\beta_7 = \gamma_{00} + \gamma_{01}PHASE\_1 + \gamma_{02}PHASE\_2 + U \quad \text{(W.1.7)}$$

$$\beta_8 = \gamma_{00} + U \quad \text{(W.1.8)}$$

$$\beta_9 = \gamma_{00} + \gamma_{01}ENV\_EXP + \gamma_{02}ASSESS\_WATER + U \quad \text{(W.1.9)}$$

Table 7.7

Level-2 Equations for Model W.2

$$\beta_0 = \gamma_{00} + \gamma_{01}PHASE\_1 + \gamma_{02}PHASE\_2 + \gamma_{03}CENTRAL + \gamma_{04}FORMAL + \gamma_{05}CRAFT + \gamma_{06}PROCEDURAL + \gamma_{07}PRODUCTION + \gamma_{08}PURPOSE + \gamma_{09}COMEPTITION + \gamma_{010}CAPACITY + \gamma_{011}ENV\_EXP + \gamma_{012}SIERRA + \gamma_{013}PUBLIC\_OP + \gamma_{014}INDIVIDUAL + \gamma_{015}MORAL + U \quad \text{(W.2.0)}$$

$$\beta_1 = \gamma_{00} + \gamma_{01}PHASE\_1 + \gamma_{02}PHASE\_2 + \gamma_{03}CENTRAL + \gamma_{04}FORMAL + \gamma_{05}CRAFT + \gamma_{06}PROCEDURAL + \gamma_{07}PRODUCTION + \gamma_{08}PURPOSE + \gamma_{09}COMEPTITION + \gamma_{010}CAPACITY + \gamma_{011}ENV\_EXP + \gamma_{012}SIERRA + \gamma_{013}PUBLIC\_OP + \gamma_{014}INDIVIDUAL + \gamma_{015}MORAL + U \quad \text{(W.2.1)}$$

$$\beta_2 = \gamma_{00} + \gamma_{01}PHASE\_1 + \gamma_{02}PHASE\_2 + \gamma_{03}CENTRAL + \gamma_{04}FORMAL + \gamma_{05}CRAFT + \gamma_{06}PROCEDURAL + \gamma_{07}PRODUCTION + \gamma_{08}PURPOSE + \gamma_{09}COMEPTITION + \gamma_{010}CAPACITY + \gamma_{011}ENV\_EXP + \gamma_{012}SIERRA + \gamma_{013}PUBLIC\_OP + \gamma_{014}INDIVIDUAL + \gamma_{015}MORAL + U \quad \text{(W.2.2)}$$

$$\beta_3 = \gamma_{00} + \gamma_{01}PHASE\_1 + \gamma_{02}PHASE\_2 + \gamma_{03}CENTRAL + \gamma_{04}FORMAL + \gamma_{05}CRAFT + \gamma_{06}PROCEDURAL + \gamma_{07}PRODUCTION + \gamma_{08}PURPOSE + \gamma_{09}COMEPTITION + \gamma_{010}CAPACITY + \gamma_{011}ENV\_EXP + \gamma_{012}SIERRA + \gamma_{013}PUBLIC\_OP + \gamma_{014}INDIVIDUAL + \gamma_{015}MORAL + U \quad \text{(W.2.3)}$$

$$\beta_4 = \gamma_{00} + \gamma_{01}PHASE\_1 + \gamma_{02}PHASE\_2 + \gamma_{03}CENTRAL + \gamma_{04}FORMAL + \gamma_{05}CRAFT + \gamma_{06}PROCEDURAL + \gamma_{07}PRODUCTION + \gamma_{08}PURPOSE + \gamma_{09}COMEPTITION + \gamma_{010}CAPACITY + \gamma_{011}ENV\_EXP + \gamma_{012}SIERRA + \gamma_{013}PUBLIC\_OP + \gamma_{014}INDIVIDUAL + \gamma_{015}MORAL + U \quad \text{(W.2.4)}$$

$$\beta_5 = \gamma_{00} + \gamma_{01}PHASE\_1 + \gamma_{02}PHASE\_2 + U \quad \text{(W.2.5)}$$

$$\beta_6 = \gamma_{00} + U \quad \text{(W.2.6)}$$

$$\beta_7 = \gamma_{00} + \gamma_{01}ENV\_EXP + \gamma_{02}ASSESS\_WATER + U \quad \text{(W.2.7)}$$

Table 7.8

Equation Symbol Descriptions

Where:	
Y_{air} =	change in annual AQI score for selected monitoring site
Y_{Water} =	change in the miles of waterways rated good
β_0 =	intercept estimation for the Level-1 model
$\beta_{1...j}$ =	slope estimations for the Level-1 model
γ_{-0} =	intercept estimations for the Level-2 equation for each Level-1 coefficient
$\gamma_{01...j}$ =	slope estimations for the Level-2 coefficients
r =	Level-1 residual
U =	Level-2 residuals
PHASE_1=	dummy variable for the first policy phase (2002 – 2006)
PHASE_2=	dummy variable for the second policy phase (2004 – 2008)
KNOWLEDGE=	score on the scientific/technical theory use index, grand mean centered
SUPPORT=	score on the policy support index, grand mean centered
DISCRETION=	score on the discretion index, grand mean centered
TRADITION=	score on the traditional role index, grand mean centered
REPRESENT=	score on the representation index, grand mean centered
PROFESSIONAL=	score on the professionalism index, grand mean centered
CENTRAL=	score on the centralization index, grand mean centered
FORMAL=	score on the formalization index, grand mean centered
CRAFT=	dummy variable for Craft agencies (Wilson, 1989)
PROCEDURAL=	dummy variable for Procedural agencies (Wilson, 1989)
PRODUCTION=	dummy variable for Production agencies (Wilson, 1989)
PURPOSE=	dummy variable for agency purpose
COMPETITION=	dummy variable for multiple state environmental agencies
CAPACITY=	score on the institutional capacity index (Bowman and Kearney, 1988)
ENV_EXP=	per capita state environmental expenditures
SIERRA=	Sierra Club group membership per capita
PUBLIC_OP=	percentage of public holding favorable opinion of environmental issues
INDIIVDUAL=	dummy variable for Individualist cultures (Elazar, 1984)
MORAL=	dummy variable for Moralistic cultures (Elazar, 1984)
GSP=	gross state product
GSP%UM=	percentages of gross state product from manufacturing and utility industries
POLLUTION=	existing pollution from the initial year of the policy phase
ASSESS_WATER=	percentage of total state waterways assessed
TOTAL_WATER=	total miles of state waterways
LAMBDA=	Heckman Correction for selection bias

The final component of the theoretical model is the concept of policy phases. The use of policy phases is an attempt to determine whether policy learning (see Sabatier and Weible, 2007) is occurring in the implementation process. To do so, dummy variables to account for policy phases will be incorporated at Level-2. Three policy phases were chosen because they can effectively capture implementation and outcomes over time, as well as provide three points to determine trends in relationships over time. Three assumptions were made in constructing policy phases: 1) the effects of implementation decisions do not affect policy outcomes for three to five years; 2) legitimate data on policy outcomes is not available until implementation decisions have had time to effect policy outcomes; and 3) adjustments to implementation actions occur in response to legitimate data. These assumptions are based on lag time estimations time from policy action to outcomes of previous studies (Ringquist, 1993a; Ringquist, 1993b; Lester et al, 1983; Lester and Bowman, 1989; Emison, 2010). Additionally, the availability of data limited the options for lag time estimates; thus, four years was the time period that meant both theoretical and practical concerns.

Based on these assumptions, three policy phases were developed. First, to produce the most contemporary analysis, the final year of the available data on policy outcomes was determined as 2010. Assuming four years before the effects of implementation decisions can be determined and valid reporting of data would not be available until the end of the policy phase; implementation decisions should be measured in 2006. Therefore, the final policy phase is 2006 to 2010. Next, the second policy phase was determined. Decisions beginning in 2006 would be based on information emerging from the end of the previous policy phase indicating policy learning, but changes in decision-making would still take a few years before they begin to effect outcomes. However, it is not necessary to assume 2006 is the last year of measurement for the policy outcomes of the previous policy phase, but it is not prudent to assume it is the first year either. Thus, it was determined that 2008 would serve as the end of the previous phase. Following the same logic as before, the second policy phase begins with implementation decisions in 2004, and ends with policy outcomes in 2008. The same process determines the first policy phase begins with implementation decisions in 2002 and ends with policy outcomes in 2006.

It is important to note that while dependent variables will be measured for the change between final years of the policy phase (2002 and 2006; 2004 and 2008; and 2006 and 2010), independent variables will be measured in the single year at the beginning of each policy phase (2002, 2004, and 2006). The assumption is the decisions being made in the beginning year of the policy phase will impact policy outcomes later, and based on the evaluations of those policy outcomes a new set of implementation decisions will be made. However, clearly implementation decisions are being made in the interim period not being measured and these decisions are having an impact. This is a notable limitation in research design. The research design follows the plan of an "experiment" design, in which the first policy phase is the control group, and second and third phases are test groups whose applied treatment is knowledge of previous implementation decisions and policy outcomes (Creswell, 2009). This is an admittedly elementary attempt to capture the relationship between implementation decisions and policy outcomes over time, but there are limited options for capturing such social phenomenon. The theoretical framework suggests that based on the feedback produced from the policy outcomes, adjustments in implementation should occur. Therefore, there should be both substantive and statistical differences between the policy phase dummy variables.

Finally, sampling size and centering decisions should be addressed as part of the statistical analysis. Sampling size in HLM is slightly different than for OLS. As explained above, statistical significance is affected by both the number of groups and the individuals within groups. The number of states is fixed and cannot be increased, but by combining the three policy phases into a single model the number of groups can be maximized. Additionally, based on the tenure of the survey respondents their responses can be included in multiple groups across time. A lack of sufficient responses for Florida, Missouri, and New Jersey resulted in their removal from the dataset (See Survey section). A lack of sufficient water quality data resulted in several states not being included during specific policy phases (See Appendix B). Thus, for the air quality models there are 1613 individuals within 141 groups; for the water quality models, 1433 within 123 groups. This is an average of about 11.5 individuals per group, which is above the minimum sample sizes suggested by Hoffman (1997), and Bickel (2007).

In this model, centering addresses the concern of the value of zero for many variables being meaningless. First, by centering the variables, the interpretation of the analysis becomes more meaningful, and cross-level relationships can be better interpreted. Several centering options are available, but as Hofmann and Gavin (1998) contend the decision should be theoretically driven. Based on their classification of assumptions, the incremental and meditational paradigms are mostly closely aligned with the theoretical framework as they both suggest a direct relationship between Level-1 and Level-2 variables. Both paradigms call for the use of either the grand mean or group mean centering approach. However, the grand mean approach offers more statistical advantages compared to other approaches, specifically with potential problems associated with covariance between intercepts and slopes (Kreft et al, 1995; Hofmann and Gavin, 1999). Therefore, the grand mean centering approach will be used for all Level-1 predictors measured on an index to ensure zero is an interpretable value (Bickel, 2007). By using the grand mean centering approach, “the variance in the intercept term represents the between group variance in the outcome variable adjusted for the level-1 variables (i.e., after partialling out or controlling for the level-1 variables)” (Hofmann and Gavin, 1998, p. 630). Since the theoretical framework suggests a direct or, in cases of state-level variables, an indirect relationship variables at Level-1 and Level-2, partialling out the variance between groups uncovers the statistical relationships between variables the theoretical framework indicates exist. The grand mean for each predictor variable will be subtracted from each individual observation on the variable.

Comparing Models

To compare models, three different statistics were calculated: Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), and the Kreft and de Leeuw (1998)/Singer (1998) R2. These three statistics provide three different perspectives on model comparison. The AIC considers both the deviance and the number of parameters in considering model strength. The BIC is similar, but places a larger penalty on the number of parameters as well as incorporates the n-size (Luke, 2004). The AIC and BIC are calculated with the following formula:

$$AIC = -2LL + 2p \qquad (7.3)$$
$$BIC = -2LL + pln(N)$$

where, -2LL is the deviance, p is the number of parameters, and N is the n-size (Luke, 2004). While the BIC was not designed for multi-level models, Luke (2004) contends the n-size used should be that of Level-1. These two statistics can only be used to compare nested models with the same dataset and dependent variable. On the other hand, the Kreft and de Leeuw/Singer R2 can be used to compare models between datasets and dependent variables. It relies on the proportional reduction of residual errors. The Kreft and de Leeuw/Singer R2 is calculated with the following formula:

$$R^2 = \frac{(unrestricted\ error - restricted\ error)}{unrestricted\ error} \qquad (7.4)$$

However, this is not a true R2 in the sense of OLS regression, since residual errors occur at both Level-1 and Level-2. Thus, one should cautiously consider it when making comparisons with single-level analysis techniques (Snijders and Bosker, 1999). The BIC and AIC have no specific interpretation to make, but the Kreft de Leeuw (1998)/Singer (1998) R2 does. For the BIC and AIC, the model with the lowest score is considered the strongest; for the Kreft and de Leeuw (1998)/Singer (1998) R2, the model with the highest score is considered the strongest.

For testing the usefulness of multi-level modeling implementation research, Ordinary Least Squares (OLS) regression models for each of the three groups (individual, organization, and state) of variables were produced. The individual variables includes: KNOWLEDGE, SUPPORT, DISCRETION, TRADITION, REPRESENT, and PROFESSIONAL. The organizational variables includes: CENTRAL, FORMAL, CRAFT, PROCEDURAL, PRODUCTION, PURPOSE, COMPETITION, CAPACITY.

The state variables includes: ENV_EXP, GSP, GSP%UM, POLLUTION, SIERRA, PUBLIC_OP, INDIVIDUAL, and MORAL. These models are labeled as Models A.5 and W.3 for the individual variables, Models A.6 and W.4 for the organizational variables, and Models A.7 and W.5 for the state variables. The policy phase variables (PHASE_1 and PHASE_2) were included in all three OLS models to control for autocorrelation error. Additionally, for the water quality models, it is necessary to include the control variables (ASSESS_WATER, TOTAL_WATER, and LAMBDA). None of the basic assumptions of OLS were violated in creating these OLS models, nor were any outlier observations removed from the analysis. The only summary statistic used for model comparison is the R2. In this case, this is a true R2 and accounts for the amount of variance explained by the model. The R2 can be used in comparison to the multilevel models, but should be done with caution as they are calculated differently. Finally, it should be noted that the OLS models are included for the sole purposes of testing the effectiveness of the multilevel approach to implementation modeling.

Dependent Variables

Environmental indicators are meant to supply information on the environment, support environmental decision making, and monitor of the effects of those decisions (Smeeting and Weterings, 1999). Based on Ward (1990), indicators will be identified based on the following criteria: capable of identifying environmental change; limited in number; scientifically based and valid; relatively easy for data collection; and sensitive to space and time. Additionally, for the purposes of this analysis, the indicators need to routinely monitored and commonly measured across the nation, as well as capable of being aggregated to the state level. Large databases available from EPA include numerous variables capable of satisfying the first set of criteria. However, there is a large selection of potential variables to choose. To reduce the number of variables, the second set of criteria is used. The wide variety of indicators were limited by the time frame in which they were monitored, the number of sites in which they are measured, and the capacity for aggregation. Based on these criteria, the large selections of potential indicators were reduced to a more manageable set of indicators for air and water quality.

Air Quality

There is wide variety of potential environmental indicators available from the Air Quality System (AQS) Data Mart maintained by EPA. The AQS Data Mart is a database for air quality information collected by EPA through the Air Quality System, as well as the substance and facility registry systems and the AirNow reporting system. Users from regulatory, academia, and research communities are able to make request of large, unlimited quantities of data for analysis. In short, the AQS Data Mart provides access to massive amount of data collected and maintained by EPA on air quality. The AQS Data Mart is accessible online through EPA's main website; however, login and passwords must be requested from the AQS staff (EPA, "AQS Data Mart: Basic Information"). The AQS Data Mart maintains a large database on indicators of air quality capable of indentifying change, are scientifically valid, sensitive to the site and time they were collected, and are readily available. While there are data on numerous air quality indicators, the crux of the CAA is focused on the six criteria pollutants; therefore, the criteria pollutants will be the focus of this analysis as well. The Air Quality Index (AQI), based on the criteria pollutants, was developed as an index for monitoring and comparison purposes. Figure 7.1 shows the AQI categories. The AQI is calculated based on ground-level ozone, particle pollution, carbon monoxide, and sulfur dioxide. The AQI is a piecewise linear function of the pollutant concentration measured on a scale from 0 to 500, with six corresponding levels of health concern.

Air Quality Index (AQI) Values)	Levels of Health Concern	Colors
0-50	Good	Green
51-100	Moderate	Yellow
101-150	Unhealthy for Sensitive Groups	Orange
151 to 200	Unhealthy	Red
201 to 300	Very Unhealthy	Purple
301 to 500	Hazardous	Maroon

Figure 7.1

Air Quality Index

Source: EPA, "Air Quality Index"

The levels of health concern range from good to hazardous air quality. The AQI is meant as a comparative measure of air pollutants. When multiple air pollutants are measured, the AQI is based on the most dominant pollutant present. Rather than focus on minute changes in pollutant levels which are incomparable, the AQI provides a more efficient measure of air quality (EPA, "AQI"). Since the primary pollutants leading to air quality concerns are not the same across the nation, analyzing individual criteria pollutants would be misleading. States are fighting different battles in the same war; thus, a measure capable of accounting for this must be used. The AQI provides for this by creating a standardized level of air quality, regardless of which pollutant or pollutants are present in any given jurisdiction; an AQI score of 100 is the same in every state.

The AQI is calculated as an average rate over a 24 hour period for a metropolitan area. Thus, there is significant variation of AQI scores throughout the year. To provide a better composite of annual air quality, an annual measure of the AQI is necessary. The AQI is calculated based on monitoring sites throughout nations, with several per state (EPA, "AQI"). The monitoring site with the highest mean AQI score for 2002 (the first year included in the analysis) was selected. This monitoring site was selected as the area most likely to attract the attention of state air quality managers, and the most likely to be effected by management efforts. Appendix A shows the data per state per year for each indicator available. Some monitoring sites are interstate due to the large metropolitan areas; in these cases, the AQI scores for those monitoring sites are used for multiple states. Philadelphia and Boston are the only metropolitan areas to be included as the monitoring sites for multiple states. However, other metropolitan areas that are located in multiple states are included as monitoring sites in Indiana, Kentucky, Mississippi, Ohio, and Oregon.

The measure used for analysis is the level of change in the AQI score over the policy phase as a count change. Thus, for Phase 1, the dependent variable is the level of change from 2002 to 2006 in the annual AQI for the selected monitoring sites. The following formula was used to calculate the air quality dependent variable:

$$\Delta AQI = \text{(AQI for Final Year of Policy Phase)} - \text{(AQI for Initial Year of Policy Phase)} \quad (7.5)$$

Water Quality

There is wide variety of potential environmental indicators available from the National Water Information System (NWIS) maintained by the U.S. Geological Survey (USGS). The USGS collects water resource data at approximately 1.5 million sites representing all 50 states, as well as U.S. territories. However, data is collected at various sites, and lacks any significant consistency across states and time (NWIS, "About"). Conversely, the National Assessment Database maintained by EPA compiles state self-reported data on water quality. While this data on specific water pollutants is subject to the same kind of validity issues as the data from NWIS, there is an inclusion of the percentage of in-state water bodies whose quality has been good or impaired. Water bodies are considered impaired if they do not meet the standards set for their assessed uses; they are rated as good if they do meet such standards. In sum, state agencies are self-reporting the amount of in-state waterways that do or do not meet water quality standards. However, this measure is only available for assessed water bodies. State agencies are responsible for the identifying, collecting, and reporting of all data, which causes concern related to selection bias. This measure provides consistency across place and time. Rather than look at pollutants that are affected by differing standards, the impaired water body measurement allows for valid comparison between states. Additionally, this is information that is easily understandable and likely to elicit responses from water quality managers (EPA, "WATERS: About This Database").

The concern with selection bias, in this case, is the portion of waterways rated as good from the assessed waterways cannot be generalized to all waterways. Thus, relying strictly on the measure of change in good waterways will created a skewed analysis. To address selection bias in the assessed waterways, the Heckman correction for selection bias is utilized (Heckman, 1979). The Heckman correction is a twostep process. First, a model for the probability of a waterway being rated as good was created, based on the portion of total waterways assessed and environmental expenditures per capita. This is represented by the following formula:

$$Prob(\,GOOD \mid Z\,) = \Phi(Z\gamma) \qquad (7.6)$$

where, GOOD is the mileage of waterways rated as good, Z is a vector of the explanatory variables, γ is a vector of unknown parameters, and Φ is the cumulative distribution function of the normal standard deviation. Second, the selection bias is corrected by including a transformation of these predicted probabilities as an additional explanatory variable (LAMBDA) (Heckman, 1979; Puhani, 2000). If LAMBDA proves to be statistically significant, selection bias is present. In sum, LAMBDA makes an estimation of the unassessed waterways that would be rated as good based on probability. Including this additional explanatory variable, corrects for these unassessed waterways in the analysis.

However, these reports are not available for all states in all years. Data is available for: 48 states in Phase 1, 42 states in Phase 2, and 37 states in Phase 3. To maximize this data, in cases in which data was not available for all three policy phases, the available data was substituted when necessary. Appendix B shows the data per state per year. Therefore, several states will not be included in analysis. This is of some concern, but the availability of data is a major constraint and cannot be easily overcome. The measure used for analysis is the change in the miles of assessed waterways rated as good over the policy phase. Thus, for Phase 1, the dependent variable is the level of change from 2002 to 2006 in the percentage of impaired water bodies within each state. The following formula was used to calculate the air quality dependent variable:

$$\Delta GOOD = \text{(GOOD for Final Year of Policy Phase)} - \text{(GOOD for Initial Year of Policy Phase)} \quad (7.7)$$

Independent Variables

Independent variables were identified along three levels of effects for policy outcomes: implementation, organization, and state-level. Implementation variables are the basis for bureaucratic decision-making; organization, the structure of the agency and the direct context of bureaucratic decision-making; and state-level, the political and economic context of the state and the context of organizational efforts. The selection of independent variables was theoretically driven with previous findings used to select the variables which operationalize central concepts theorized to effect policy outcomes. The measurement of the independent variables was based on the previous research when available, and was originally developed for this analysis when not available. The independent variables are described below based on the relevant level of the model. All independent variables are measured for the years 2000, 2003, and 2006; unless, otherwise specified.

Implementation Decisions

At the individual level, the model consists of variables selected for inclusion for their measurement of the decision-making paradigm utilized by front-line operators of state environmental agencies. Several scholars contend higher level aspects of the implementation process must be filtered through front-line operators, and therefore these decisions have considerable influence on outcomes (Van Meter and Van Horn, 1975; Lipsky, 1980). Failure to include individual level variables would lead to the same criticisms launched at the top-down implementation models, as it would ignore the role of street-level bureaucrats and the use of their discretionary decision making in implementing policy (Lipsky, 1980; Matland, 1995; O'Toole, 2000; deLeon and deLeon, 2002). Moreover, the theory previously presented indicates the decisions of front-line operators have the most direct impact on policy outcomes. However, the role of individual decision-making criteria has not been widely applied in quantitative analysis of implementation or in environmental policy outcomes. As such, the variable selection is theoretically driven through the work of existing implementation and bureaucratic decision making literature in public administration.

Scientific and technical theory is important in creating a guiding logic and informing decisions for bureaucrats. Sabatier and Mazmanian (1980) contend the tractability of policy problems are heavily influenced by the availability and use of scientific/technical theory. However, there is no guarantee of the use of scientific/technical theory by bureaucrats, even if available. The survey items presented in Table 7.9 were developed to test the concept suggested by Sabatier and Mazmanian

(1980). The survey items are concerned with knowledge, use, and perceptions of scientific/technical theory related to bureaucratic tasks.

Table 7.9

Use of Scientific/Technical Theory Survey Items

Knowledge of Scientific/Technical Theory 1. I am knowledgeable about current scientific/technical theory relative to my job. 2. I utilize scientific/technical theory when making implementation decisions. 3. Existing scientific/technical theory is comprehensive enough to guide implementation efforts.

For the three items, responses were scored based on the following: definitely disagree (1), somewhat disagree (2), neutral (3), somewhat agree (4), or definitely agree (5). An average score on these questions was then computed for each individual respondent, creating a single numerical score for the index. The score range for the measures ranging from 1 to 5. This variable will be referred to as: KNOWLEDGE.

As bureaucrats serve as policymakers, their support, or lack thereof, has a significant impact on their decision making. Additionally, perceptions of support from other political actors can impact behavior (Egeberg, 1995; Perry, 1996; May and Winter, 2009). The survey items presented in Table 7.10 were developed based on the concepts suggested by previous research concerning perceptions of support by policy stakeholders. The survey items are concerned with policy support of the individual, and the perceptions of policy support of the CAA and CWA of front-line operators, managers, politicians, and the public relative. Items are concerned with both the support of the goals and the efforts of government in achieving those goals, as they represent both purpose of policy and the implementation activities.

Table 7.10

Perceptions of Support for Environmental Policy Survey Items

Individual Support
1. I support the goals of environmental policy
2. I support the government efforts required to achieve the goals of environmental policy.

Peer Support

3. My peers support the goals of environmental policy.
4. My peers support the government efforts required to achieve the goals of environmental policy.

Superior Support

5. My superiors organization support the goals of environmental policy.
6. My superiors support the government efforts required to achieve the goals of environmental policy.

Public Support

7. The public supports the goals of environmental policy.
8. The public supports the government efforts required to achieve the goals of environmental policy.

For the eight items, responses were scored based on the following: definitely disagree (1), somewhat disagree (2), neutral (3), somewhat agree (4), or definitely agree (5). An average score on these questions was then computed for each individual respondent, creating a single numerical score for the index. The score range for the measures ranging from 1 to 5. This variable will be referred to as: SUPPORT.

The use of discretion by front-line operators is the basis for the bottom-up perspective of implementation, and thus is an important concept to capture in this analysis. Sowa and Selden (1997) develop three indices to measure the use of discretion by administrators. The items categorized by their respective indices are presented in Table 7.11. Administrative discretion "captures how much discretion administrators perceive themselves to have over outcomes directed toward clients and how much discretion they perceive themselves to have over certain agency operations" (Sowa and Selden, 1997, p.

704). Traditional role acceptance captures "administrators who focus on efficiency in the operation of agency processes" (Sowa and Selden, 1997, p. 704). Finally, administrative representation captures the perception of bureaucrats in their role to increase representation of the public in implementation decision-making.

The original items were designed for individual organizational members. However, the original surveys were designed for Farmers' Home Administration county supervisors, and therefore contain wording that is not applicable to environmental policy. The wording in the original survey items was altered to accommodate the focus of this research. Additionally, rather than general representation, Sowa and Selden (1997) were concerned with minority representation specifically. Wording on these questions were changed, as well, to accommodate a broader concept of active bureaucratic representation (see Krislov and Rosenbloom, 1981, Mosher, 1982, or Selden, 1997).

For the three indices, responses were scored based on the following: definitely disagree (1), somewhat disagree (2), neutral (3), somewhat agree (4), or definitely agree (5). An average score on these questions was then computed for each individual respondent, creating a single numerical score for each index. The score range for the measures ranging from 1 to 5. These variables will be referred to as: DISCRETION; TRADITION; and REPRESENT.

Table 7.11

Administrative Discretion, Traditional Role, and Bureaucratic Representation Survey Items

Administrative Discretion:

1. I have discretion in determining violations of federal environmental policies.
2. I have discretion in determining violations of state environmental policies.
3. I have discretion in implementing policies.
4. I have discretion in determining violations of federal environmental policies when the decision is borderline.
5. I have discretion in determining violations of state environmental policies when the decision is borderline.

Traditional Role:

1. Regarding program implementing, I should limit my concern to the efficient carrying out of my departmental programs and duties.
2. I should limit my concern with "how" federal programs and services are implemented and, in particular, to the efficient execution of my own departmental duties.
3. I should actively advocate in favor of hiring and promotion of individuals with a focus on equal opportunity and merit.
4. Efficiency, effectiveness, and economy are the most important criteria of success in implementation.[1]

Bureaucratic Representation:

1. I should seek to provide information to policy makers to assist them in making decisions concerning community needs and perspectives.
2. I should recommend or actively advocate in favor of policies which address the needs and concerns of clients.
3. I should be supportive of procedures which may result in greater and more equitable access by to federal programs and services.
4. I should actively advocate in favor of a more equitable distribution of program services including recommending procedural service delivery alternatives when necessary.
5. I should recommend and/or actively advocate in favor of institutional changes which may result in greater governmental responsiveness.

Finally, previous research has relied on the instrument developed by Hage and Aiken (1967) for the measurement of professionalism; this study will follow suit (Andrews, 2010). Hage and Aiken (1967) developed seven survey items divided into two indices to measure the two components of organizational structure. The items

[1] This item is in addition to the items developed by Sowa and Selden (1997).

categorized by their respective indices are presented in Table 7.12. Agency professionalism is degree to which the workforce is trained and participates in their specialized, professional field of work, and measured by the professional activity and professional training indices.

Respondents were awarded one point for each professional activity and one point for each level of professional training. An average score on these questions was then computed for each index. The mean of the two index score was then calculated, creating a single numerical score. The score range for the professionalism measures were 0 to 3. This variable will be referred to as: PROFESSIONAL.

Table 7.12

Professionalism Survey Items

Professional Activity
1) Belonging to a professional organization
2) Attending at least two-thirds of the previous six meetings of the professional organization
3) Presenting a paper or holding an office in a professional organization
Professional Training
0) Lack of training beyond a college degree and lack of other professional training
1) Lack of training beyond a college degree, but other professional training.
2) Training beyond a college degree and lack of other professional training
3) Training beyond a college degree and other professional training

Source: Hage and Aiken (1967)

Organizational Characteristics

At the organizational level, the model consists of variables selected for inclusion for their measurement of the organizational characteristics of state environmental agencies. Several studies have indicated that organizational structure and capacity hold a significant and substantive relationship with organizational performance and policy outcomes (see Chapter 4). Failure to include organizational variables would likely lead to a misspecification of the general model, as organization matters in policy administration (Wilson, 1989). Moreover, the theory presented in previous chapters suggests state organization of environmental protection efforts are a vital part of the context of implementation and administration of federal environmental policy. However, the role of organizational factors has not been widely applied in the area of environmental policy. As such, the variable selection is theoretically driven through the work of organizational theorist and previous work on institutional capacity in state administration.

The first two variables are agency variables, which will describe structural components of specific agencies. Previous research has relied on the instrument developed by Hage and Aiken (1967) for the measurement of centralization and formalization; this study will follow suit (Andrews, 2010). Hage and Aiken (1967) developed 16 survey items divided into four indices to measure the two components of organizational structure. The items categorized by their respective indices are presented in Table 7.13. Agency centralization is the degree to which decision making and authority is concentrated in the agency executive, and measured by the participation in decision making and hierarchy of authority indices. Agency formalization is the degree to which job roles, responsibilities, and rules are formally applied and enforced, and measured by the job codification and rule observation indices.

Table 7.13

Centralization and Formalization Survey Items

Participation in Decision Making[2] 1) I frequently participate in the decision to hire new staff. 2) I frequently participate in decisions on the promotion of any of the professional staff. 3) I frequently participate in decisions on the adoption of new policies. *4)* I frequently participate in the decisions on the adoption of new programs. *Hierarchy of Authority* 1) There can be little action taken here until a supervisor approves a decision. 2) A person who wants to make his own decisions would be quickly discouraged. 3) Even small matters have to be referred to someone higher-up for a final answers. 4) I have to ask my boss before I do almost anything. 5) Any decision I make has to have my boss's approval
Job Codification 1) I feel that I am my own boss in most matters. 2) A person can make his own decisions without checking with anybody else. 3) How things are done here is left up to the person doing the work. 4) People here are allowed to do almost as they please. 5) Most people here make their own rules on the job. *Rule Observation* 1) The employees are constantly being checked on for rule violations. 2) People here feel as though they are constantly being watched to see that they obey all the rules.

Source: Hage and Aiken (1967)

The original items were designed for individual organizational members (see Survey Design Section). For the two indices, responses were scored based on the following: definitely disagree (1), somewhat disagree (2), neutral (3), somewhat agree (4), or definitely agree (5). An average score on these questions was then computed for each individual respondent, creating a single numerical score for each index. As this is an organizational level variable, the average score on each index was then computed for

[2] Question wording was altered to accommodate a change in the answer Likert scale from a frequency-based scale (never to always) to an agree-disagree based scale (definitely disagree to definitely agree) to allow for continuity across questions. See Hage and Aiken (1967) for the original wording.

each state; the state average on these two indices serves as the predictor variable. The score range for the measures ranging from 1 to 5. This variable will be referred to as: CENTRAL; and FORMAL.

The work of Wilson creates an organizational typology that while not applied previously applied to organizational performance provides a theoretical basis to inquire about the logic of task in which agencies are approaching the same functions (See Chapter 4). The Wilson typology includes four organizational types based on the use of outcomes and outputs in the logic of task: production (both outcomes and outputs); procedural (outputs, but not outcomes); craft (outcomes, but not outputs); and coping (neither outcomes nor outputs) (Wilson, 1989). An index for each component was developed which includes three items each. The use of multiple items serves three purposes. First, it requires the respondent to considered different facets of outcomes and outputs within the organization. Second, Wilson specifically notes both the need to observe the component and easily measure it; these are two separate issues to consider. Additionally, the prioritization of these components is equally as important in defining the logic of task for organizations. Finally, the multiple items allows for a more accurate measure of the concepts. Respondents may be mistaken on a single item, but it is less likely they mistakenly respond on multiple items.

The items are designed for answer at the individual level, but will be aggregated to the organizational level in the same manner as CENTRAL and FORMAL; therefore, survey respondents were asked to consider the organization in answering the questions. The items used within each index are presented in Table 7.14.

Table 7.14

Wilson's Agency Type Survey Items

Outcomes
1. The outcomes of the work performed by this organization are observable.
2. The outcomes of the work performed by this organization are easily measurable.
3. The priority of this organization is achieving desired outcomes of the law.
Outputs
1. The outputs of the workers within this organization are observable.
2. The outputs of the workers within this organization are easily measurable.
3. The priority of this organization is completely the outputs prescribed by the law.

The survey items were developed to capture the concepts suggested by Wilson (1989). Responses were assigned numerical scores from one to four depending on whether answered definitely disagree (1), somewhat disagree (2), neutral (3), somewhat agree (4), or definitely agree (5). The sum total for the three items was then calculated, with scores ranging from 3 to 15. The mean of the individual responses per agency were calculated as the agency's score on the index. Based on the scores for each index, agencies were then classified into the Wilson agency typology based on the use of outcomes and outputs. The point of division for the inclusion of outcomes/outputs as observable/measurable was the numerical mean on each index. Thus, if the state average score for outcomes and outputs is below the mean for all states, the state is considered to have a Coping agency.

Following classification of agency types, three dummy variables were created. The dummy variables were created for production, procedural, and craft organizations. For each dummy variable, the agencies following within that category were coded with a 1, and all other agencies were coded as 0. Thus, these agencies were held in comparison to coping organizations. Coping organizations were used as the control type as it includes neither an emphasis on outcomes nor outputs making the effects of the use of those components easier to determine. These variables will be referred to as: CRAFT; PROCEDURAL; and PRODUCTION.

State agencies responsible for environmental policy come from a variety of approaches ranging from environmental protection to public health to niche purposes. Bacot and Dawes (1997) draws the biggest distinction between "mini-EPA" type agencies and all others. Other studies have articulated a similar distinction between agencies (Goggin et al, 1990; Ringquist, 1993b; Breaux et al 2010). While dummy variables could be created to distinguish all the different variations between of environmental agencies, the result would likely reduce the overall parsimony of the model and affect the significance of the findings by including more variables than necessary. Thus, agency purpose will be measured as a dummy variable with "mini-EPA" agencies coded as 1 and all other types being coded as 0. The "mini-EPA" designation will be provided to any agency whose primary function is for environmental protection or quality, with the purpose being determined by a review of the agency's mission statement obtained from the individual agency websites. This variable will be referred to as: PURPOSE.

Inter-agency competition is the degree to which state-level environmental efforts are concentrated. Centralization at the state-level is a determinant of overlapping jurisdictions and competition between agencies, which impact service provision in efficiency and representation (Buchanan and Tullock, 1962). Even in states in which air and water quality efforts are concentrated in a single agency, alternative agencies may have responsibility for some aspect of environmental protection leading to a competition for resources and prestige between agencies. Even when competition does not extend into air and water quality efforts, it can affect agency culture, resources, and relationships with elected officials. In the simplest terms, it is the number of state agencies with functions of implementing federal environmental policy. State centralization differs from agency centralization, as state centralization is concerned with the division of state environmental efforts and agency centralization is concerned with the concentration of decision making and authority within specific agencies. Inter-agency competition is measured as a dummy variable, with states with a single agency coded as 0 and states with multiple agencies coded as 1. The data was obtained from EPA's list of state environmental agencies. This variable will be referred to as: COMPETITION.

Finally, state institutional capacity is the ability of state government: "1) to respond effectively to change; 2) to make decisions efficiently, effectively (i.e., rationally) and responsively; and 3) to manage conflict" (Bowman and Kearney, 1988, p. 343). The measurement developed by Bowman and Kearney (1988) was suggested as the most effective capture of institutional capacity by Lester (1994). The same measure was employed by Breaux, et al (2010). Bowman and Kearney (1988) uses factor analysis on 32 variables of legislative and executive institutions, creating four categories of capacity: staffing and spending, accountability and information management, executive centralization, and representation. The factor scores along the four dimensions, included in the article, were summed together to create a single institutional capacity score for each state (Breaux et al, 2010). While Bowman and Kearney (1988) could be considered dated, the institutional arrangements on these measures for the states has remained largely intact. This variable will be referred to as: CAPACITY.

State Socio-Political and Economic Characteristics

At the state level, the model consists of variables selected for inclusion for their measurement of the socio-political and economic characteristics of states. Several studies have indicated the environment in which public policy and administration occurs has an important impact on policy outcomes. Failure to include state variables would likely lead to a misspecification of the general model, since state factors have been proven to influence environmental politics and policy (See Chapter 3). Moreover, the theory presented in previous chapters suggests state socio-political and economic factors are a vital part of the context of implementation and administration of federal environmental policy. The variable selection is theoretically driven based on the work of previous scholars in this field.

State expenditures are a direct measure of resources dedicated to policy implementation and administration efforts. Data on state expenditures for environmental efforts was obtained from two reports from the Environmental Council of the States (ECOS, 2006; ECOS, 2008). Since the use of economic data over time is prone to autocorrelation effects from inflation, it is necessary to convert the raw expenditure data into a consistent measure of value over time. To do so, the Consumer Price Index (CPI) was used to convert the nominal value of expenditures into real value. The CPI, obtained from the U.S. Bureau of Labor Statistics, was used to convert yearly data to real 2005 dollars. Additionally, these resources will be measured per capita by dividing by the population estimate, to gain a better comparison of dedication of resources. This variable will be referred to as: ENV_EXP.

As state wealth has been determined to be a major factor influencing policy outcomes, a measure of economic development is necessary. In this case, economic outputs are the most direct contributor to pollution, with gross state product (GSP) per capita being the most prominent indicator used by other researchers. However, using GSP as a rate presents a certain logical problem in this analysis, since pollution is not measured as a rate. For example, Mississippi and Idaho have similar GSP per capitas, being two of the poorest states in the nation. Theoretically, if we use GSP per capita as a measure of wealth, they should then share similar pollution levels with government environmental agencies being the explanatory variable in differences. However, Mississippi's GSP as a whole is nearly double that of Idaho; thus, twice the economic processes are occurring within the boundaries of Mississippi than in Idaho. Therefore, similar pollution levels cannot be assumed, since the major contributor of pollution is occurring at such a higher level in Mississippi than in Idaho. Consequently, a raw measure to capture economic processes must be used. Nevertheless, existing pollution levels and industrial sectors will be controlled for as well. Additionally, to control for the autocorrelation effects of inflation, wealth must be comparable over time. Therefore, state wealth was measured by gross state product in chained 2005 dollars. The source for this data was the U.S. Bureau of Economic Analysis. This variable will be referred to as: GSP.

Additionally, existing levels of pollution are important control variable for the capacity of states to effect change in environmental quality. An improvement of 40 points on the AQI is not the same for monitoring sites with starting measurements of 100 and 400. Thus, it is necessary to control for the static level of pollution within the state. To do so, the initial measurement from the first year of each policy phase will be included. This variable will create a control level against which changes can be assessed. Interest groups are important factors in influencing government efforts. The influence of industries and industrial interest groups most responsible for environmental pollutants is likely to be stronger in states in which they play a larger role in the overall economy. The economic sectors with the largest production of pollutants are the manufacturing and utility industries. To account for this, a measure of the strength of these industries in state economies will be included (Ringquist, 1993b). The measure will be calculated by dividing the total gross state product by the sum of the gross state product for the utility and manufacturing industries. The source for this data will be the U.S. Bureau of Economic Analysis. This variable will be referred to as: GSP%_UM.

Environmental interest group strength is the counterbalance to industrial interest groups. The Sierra Club is one of the most prominent environmental organizations in the United States. Previous studies have relied on its membership as a measure of environmental group strength within the states (Ringquist, 1993b; Bacot and Dawes, 1997; Breaux et al, 2010). To measure the strength of environmental interest groups, the per capita membership of the Sierra Club was calculated by dividing the annual membership by the state population. Data on annual membership was obtained directly from the Sierra Club. This variable will be referred to as: SIERRA.

Public opinion on the environment is an important indicator of the political context of environmental actions from the state government. The National Election

Studies (NES) are a series of surveys administered mostly during national elections as in-person interviews since 1948. The NES contains several questions concerning the environment that can be analyzed by state and year. However, due to concerns of continuity of questions and specificity, the measure chosen was a feeling thermometer for environmentalists groups. Favorable feelings toward environmentalist groups should be a reflection of favorable public opinion on the environment. The text of the question asks the respondent to rate the group based on a thermometer between 0 and 100, with 50 to 100 reflecting warm feelings toward the group and 0 to 50 reflecting cold feelings toward the group. The mean average per state per year was calculated. This variable will be referred to as: PUBLIC_OP.

Political culture, while a more abstract concept, attempts to capture the patterns of shared beliefs and values of the public orientation towards government and its functions. Among the most used measure of political culture is the typology developed by Elazar (1984), which outlines three cultural types: moralist, individualist, and traditionalist. First, individualist political cultures relies the marketplace as the basis for democratic order. Good individualistic government should open access to the economic marketplace, serve to encourage individuals to act innovatively, and restrict itself to the primarily economic realm. Policies are determined in response to public demand (Elazar, 1984). Second, the moralistic political culture relies on the common public good as the source of democratic order. Good moralistic government should promote the public good. Policies are meant to promote broadest common welfare, regardless of public pressure (Elazar, 1984). Finally, the traditionalistic politic culture relies on elitism and paternalism in the democratic order, in which most individuals are too ambivalent to participate in government. Good traditionalistic government maintains the status quo and traditional patterns. Policies are primarily determined by the elite (Elazar, 1984). States will be classified based on identifications advanced by Elazar (1984). While the original work has been criticized in other works as being outdated, Morgan and Watson (1991) contend there has been little change in state cultures based on Elazar's work. These variables will be referred to as: INDIVIDUAL; and MORAL.

Survey Data

The purpose of the survey is to capture the decision-making criteria used in implementation decisions, and perceptions of organization structural factors. The sample population is employees of state environmental agencies. A random sample of 80 employees from each state agency was identified from state employee directories (Fink, 2003; Chambers and Clark, 2009; Chambers and Clark, 2012). The random sample was distributed equally across agencies, but the response rate was not. However, the statistical assumptions of HLM 7.0 balance the coefficient estimates based on the statistical significance at the group level; therefore, states with lower response rates will be weighted less in the final coefficient estimates since they will inevitably have less statistical significance (Bickel, 2007).

An email survey was chosen because of its advantages in costs, speed of response rates, and data management (Bethlehem and Biffignandi, 2012). Nevertheless, response rates for email surveys are less predictable than for mail surveys. Comparisons of internet and mail based surveys have found that email surveys tend to have notably lower responses rates (Kwak and Radler, 2002; Shih and Fan, 2009). Out of the 4000 surveys distributed, 592 responses were collected, resulting in a response rate of 14.8%. This is at the lower end of email response rates, but is still within the reported range (Kwak and Radler, 2002; Baruch and Holtom, 2008; Shih and Fan, 2009). State-by-state response rates are reported in Appendix C; response rates ranged from 0% (Florida) to 36.25% (Mississippi). The survey was supported online through Qualtrics, which allows for a variety of survey design, distribution, and response considerations. Access to Qualtrics was granted through the site license of the College of Arts and Sciences at Mississippi State University.

Survey participants were contacted five times to be recruited as participants in the survey. First, a pre-survey notification email was sent to all participants, and can be found in Appendix D. Pre-survey notification has been found to increase survey participation (Kwak and Radler, 2002). Additionally, it will allow for the confirmation of emails (Orgeron, 2008). Second, one week after the pre-survey notification was sent, the survey link and recruitment letter was sent to all participants, and can be found in Appendix E. The recruitment letter requested participation in the survey, provided for informed consent, and directed participants to the online survey. Third, three follow-ups were made requesting participation in the survey, which can be found in Appendix F. The survey reminder emails were distributed weekly. Survey reminders have been found to increase survey participation and allow participants multiple opportunities to participate (Kwak and Radler, 2002).

The survey includes 59 survey questions in 11 categories, those questions outline above and demographic information. Screen shots of the online survey can be found in Appendix G. The survey responses are designed to be answered cross-sectional for two time periods: when the respondent first began work at the agency; and when the survey was distributed. Respondents were to consider each time period separately when answering questions. The survey took approximately 15 minutes to complete, and covered a broad range relative to policy implementation and agency organization.

Individuals were organized into groups based on state of employment and tenure within agency. Regarding tenure, respondents had five answer choices: 1) Less than 1 year; 2) 1-3 years; 3) 3-6 years; 4) 6-9 years; and 5) 10 or more years. All responses from when the survey was distributed were included in policy phase 3 (2006 – 2010). For policy phase 2 (2004 – 2008), two sets of responses were included: 1) the responses from when employment first began for those who indicate tenure length of 1-3 years or 3-6 years; and 2) the average response between when employment first began and from when the survey was distributed for those who indicated tenure length of 6-9 years or 10 or more years. For policy phase 1 (2002 – 2006), responses from when employment first began for those who indicated tenure length of 6-9 years or 10 or more years were included. Policy phase 1 included 469 observations at the individual level; policy phase 2, 562 observations; and policy phase 3, 584 observations.

To maximize data, a method for dealing with missing survey responses had to be developed as well. In the case that respondents missed/skipped a single question within a group of questions related to an index, the index mean was calculated based on those questions that were answered. In the case that respondents missed/skipped an entire group of questions related to an index, the state average for the policy phase was substituted. This method was used to maximize the number of individual observations within the dataset.

CHAPTER 8

AIR AND WATER QUALITY FINDINGS

This chapter presents the findings from the analysis of multi-level factors influencing policy outcomes for air and water quality. Air and water quality are discussed separately. While both fall under the umbrella of environmental policy, the findings do indicate the presence of different relationships between predictor variables and policy outcomes. For simplicity, the findings are discussed based on groupings of predictor variables, followed by a comparison of models. The findings support several components of the theoretical framework with statistically significant and substantively important results. The discussion and tables of the results focus on three components: Level-1 fixed effects, Level-2 fixed effects, and model summary statistics. It should be noted that the cross-level effects are not included in the discussion. Although cross-level effects (that is the relationship between Level-1 and Level-2 predictor variables) exist, the focus of this analysis is on policy outcomes. There are as many as 134 parameters for some models, meaning that in the sheer complexity of presenting the many cross-level relationships, the focus of the analysis may be lost. The Level-2 fixed effects reported are the relationships between the Level-2 predictors and the Level-1 intercept. Thus, the Level-2 fixed effects reported are the relationships between the Level-2 predictors and policy outcomes, when considering the effects of the Level-1 predictors. In the simplest terms, if an increase in gross state product at Level-2 results in an increase in the intercept at Level-1, the increase in the Level-1 intercept will directly result in the same increase in the dependent variable. Finally, a brief summary statement concerning the findings will be included, but a more elaborate discussion of the findings, their relationship to the theoretical framework, and conclusions concerning this research will be presented in the next chapter.

Air Quality

The findings of the analysis of the multi-level model for air quality policy outcomes are presented in Table 8.1. The table presents four models: Model A.1, includes direct economic effects on policy outcomes; Model A.2, includes indirect economic effects; Model A.3, removes the statistically insignificant predictor variable from Model A.1; and, Model A.4, removes the statistically insignificant predictor variable from Model A.2.

Implementation Decisions

The decision-making variables for front-line operators include: the use of scientific/technical knowledge (KNOWLEDGE); perception of policy support by stakeholders (SUPPORT); degree of discretion (DISCRETION); value of traditional public management role (TRADITION); value of role of public administrators as representatives of the public (REPRESENT); and, degree of professionalism (PROFESSIONAL). The range of change in median air quality for the selected monitoring sites is 62 to -62, with the median at -4.27. First, KNOWLEDGE is statistically significant in all four models. For Model A.1, an increase of one point in the use of knowledge index results in a 27.86 point reduction in the median AQI score over the policy phase; for Model A.3, a one point increase in the use of knowledge index results in a 31.15 point reduction in median AQI. For Model A.2, an increase of one point in the use of knowledge index results in a 32.15 point reduction in the median AQI score over the policy phase; for Model A.4, a one point increase in the use of knowledge index results in a 29.36 point reduction in median AQI.

Second, SUPPORT is only statistically significant in Models A.2 and A.4; it was not included in Model A.3. For Model A.2, an increase of one point in the policy support index results in a 54.72 point reduction in the median AQI score over the policy phase; for Model A.4, a one point increase in the policy support index results in a 49.49 point reduction in median AQI. The same directional relationship exists in Model A.1, but with a statistically insignificant coefficient.

Third, DISCRETION is statistically significant in all four models. For Model A.1, an increase of one point in the discretion index results in a 20.85 point reduction in the median AQI score over the policy phase; for Model A.3, a one point in the discretion index results in a 22.29 point reduction in median AQI. For Model A.2, an increase of one point in the discretion index results in a 24.44 point reduction in the median AQI score over the policy phase; for Model A.4, a one point increase in the discretion index results in a 26.29 point reduction in median AQI. Fourth, TRADITION is not statistically significant either Model A.1 or A.2; it was not included in Models A.3 and A.4.

Table 8.1

Hierarchical Linear Models (HLM) of Air Quality Policy Outcomes

Fixed Effects	Model A.1	Model A.2	Model A.3	Model A.4
Level-1				
KNOWLEDGE	-27.86 (11.08)*	-32.15 (12.68)*	-31.15 (9.20)***	-29.36 (12.79)*
SUPPORT	-6.04 (14.19)	-54.72 (16.5)***	-	-49.49 (16.8)**
DISCRETION	-20.85 (8.36)*	-24.44 (9.63)*	-22.29 (6.83)***	-26.29 (9.70)**
TRADITION	-12.24 (12.72)	1.98 (15.21)	-	-
REPRESENT	42.37 (13.14)***	59.12 (15.2)***	46.54 (10.5)***	55.69(15.17)***
PROFESSION	22.72 (10.59)*	21.22 (11.74)	20.38 (8.61)*	-
POLLUTION	-0.78 (0.02)***	-	-0.76 (0.02)***	-
GSP	0.18 (0.01)***	-	0.17 (0.01)***	-
GSP%UM	-55.72 (6.30)***	-	-49.50 (6.07)***	-
Level-2				
PHASE_1	-15.26 (1.89)***	8.09 (0.63)***	-15.39 (1.87)***	7.94 (0.64)***
PHASE_2	-13.87 (1.82)***	4.29 (0.52)***	-14.20 (1.84)***	4.33 (0.53)***
CENTRAL	-7.19 (1.22)**	-9.09 (1.34)***	-6.68 (1.14)***	-8.96 (1.33)***
FORMAL	0.07 (1.35)	3.91 (1.48)**	-	3.61 (1.48)*
Agency Type	-	-	-	-
-CRAFT	-5.37 (1.44)***	-6.73 (1.61)***	-5.91 (1.31)***	-6.56 (1.62)***
-PROCEDURE	-5.55 (0.67)***	-4.32 (0.75)***	-5.76 (0.65)***	-4.23 (0.75)***
-PRODUCT	-5.32 (0.52)***	-3.92 (0.57)***	-5.73 (0.50)***	-3.63 (0.57)***
PURPOSE	5.88 (0.50)***	4.96 (0.55)***	5.53 (0.47)***	4.99 (0.56)***
COMPET	0.80 (0.52)	1.74 (0.57)**	-	1.70 (0.57)***
CAPACITY	-1.13 (0.19)***	-1.27 (0.21)***	-1.22 (0.18)***	-1.29 (0.21)***
ENV_EXP	-0.04 (0.003)***	-0.03 (0.003)***	-0.04 (0.003)***	-0.03 (0.003)**
SIERRA	-1223.19 (233.66)***	-1437.31 (258.13)***	-1132.53 (224.64)***	-1410.68 (256.15)***
PUBLIC_OP	-12.38 (3.56)***	-25.26 (3.80)***	-12.30 (3.51)***	-24.19 (3.85)***
Pol. Culture	-	-	-	
-INDIVIDUAL	-7.19 (0.68)***	-7.53 (0.75)***	-6.19 (0.62)***	-6.64 (0.74)***
-MORAL	-4.37 (0.74)***	-5.17 (0.82)***	-3.73 (0.70)***	-4.58 (0.82)***
GSP	-	0.13 (0.01)***	-	0.13 (0.01)***
GSP%_UM	-	-64.62 (5.40)***	-	-63.53 (5.4)***
POLLUTION	-	-0.54 (0.02)***	-	-0.54 (0.02)***
Constant	86.34 (6.98)***	89.12 (7.64)***	82.64 (5.93)***	87.20 (7.69)***
BIC	12196.71	11819.46	11579.68	12024.07
AIC	11162.39	11475.00	11148.81	11507.03
R2	0.618	0.543	0.601	0.511
Deviance	11207.00	10918.39	10988.81	11315.03
Parameters	134	122	80	96
N (Level-1)	1613	1613	1613	1613
N (Level-2)	141	141	141	141

*p<.05, **p<.01,***p<.001

Fifth, REPRESENT is statistically significant in all four models. For Model A.1, an increase of one point in the representative role index results in a 42.37 point increase in the median AQI score over the policy phase; for Model A.3, a one point increase in the representative role index results in a 46.54 point increase in median AQI. For Model A.2, an increase of one point in the representative role index results in a 59.12 point increase in themedian AQI score over the policy phase; for Model A.4, a one point increase in the representative role index results in a 55.69 point increase in median AQI. Finally, PROFESSIONAL is only statistically significant in Models A.1 and A.3; it was not included in Model A.4. For Model A.1, an increase of one point in the professionalism index results in a 22.72 point increase in the median AQI score over the policy phase; for Model A.3, a one point in the professionalism index results in a 20.38 point increase in median AQI. The same directional relationship exists in Model A.2, but with a statistically insignificant coefficient.

Based on the statistical findings, there is substantive evidence to accept the relationships between the use of scientific/technical knowledge, bureaucratic discretion, and the value of the representative role and the change in the median AQI score over policy phases. The coefficients and directional relationships remained stable between models. To a lesser extent, there is some evidence to support the relationship professionalism and perceptions of policy support and the change in the median AQI score over policy phases. The coefficients for these variables were statistically insignificant in at least one model. However, the directional relationships between models remain the same, suggesting that it may have some validity. Nevertheless, the results concerning these two variables should be viewed with some skepticism. It appears that the basis on which decisions are being made during the implementation process by front-line operators is considerably important in predicting outcomes in air quality. While previous models have focused on organizational-level or state-level variables, these findings confirm that individual-level variables should not be overlooked.

Organizational Factors

The organizational-level variables include: centralization of authority (CENTRAL); formalization of job roles (FORMAL); agency type (CRAFT, PROCEDURAL, PRODUCTION); agency purpose (PURPOSE); inter-agency competition (COMPETITION); and institutional capacity (CAPACITY). First, CENTRAL is statistically significant in all four models. For Model A.1, an increase of one point in the centralization index results in a 7.19 point reduction in the median AQI score over the policy phase; for Model A.3, a one point increase in the centralization index results in a 6.68 point reduction in the median AQI. For Model A.2, an increase of one point in the centralization index results in a 9.09 point reduction in the median AQI score over the policy phase; for Model A.4, a one point increase in the centralization index results in a 8.96 point reduction in the median AQI.

Second, FORMAL is only statistically significant in Models A.2 and A.4; it is not included in Model A.3. For Model A.2, an increase of one point in the formalization index results in a 3.91 point increase in the median AQI score over the policy phase; for Model A.4, a one point increase in the formalization index results in a 3.61 point increase in the median AQI. The same directional relationship exists in Model A.1, but with a statistically insignificant coefficient.

Third, agency type is a dummy variable comparing three agency types (CRAFT, PROCEDURAL, PRODUCTION) to the fourth (COPING). CRAFT is statistically significant in all four models. For Model A.1, states with a craft agency experience a 5.37 point decrease in median AQI score over the policy phase, compared to states with a coping agency; for Model A.3, states with a craft agency experience a 5.91 point decrease in median, compared to states with a coping agency. For Model A.2, states with a craft agency experience a 6.73 point decrease in median AQI score over the policy phase, compared to states with a coping agency; for Model A.4, states with a craft agency experience a 6.56 point decrease in median AQI, compared to states with a coping agency.

PROCEDURAL is statistically significant in all four models. For Model A.1, states with a procedural agency experience a 5.55 point decrease in median AQI score over the policy phase, compared to states with a coping agency; for Model A.3, states with a procedural agency experience a 5.76 point decrease in median AQI, compared to states with a coping agency. For Model A.2, states with a procedural agency experience a 4.32 point decrease in median AQI score over the policy phase, compared to states with a coping agency; for Model A.4, states with a procedural agency experience a 4.23 point decrease in median AQI, compared to states with a coping agency.

PRODUCTION is statistically significant in all four models. For Model A.1, states with a production agency experience a 5.32 point decrease in median AQI score over the policy phase, compared to states with coping agencies; for Model A.3, states with a production agency experience a 5.73 point decrease in median AQI, compared to states with coping agencies. For Model A.2, states with a production agency experience a 3.92 point decrease in median AQI score over the policy phase, compared to states with coping agencies; for Model A.4, states with a production agency experience a 3.63 point decrease in median AQI, compared to states with coping agencies.

Fourth, PURPOSE is a dummy variable comparing mini-EPA type agencies to all other agency types. PURPOSE is statistically significant in all four models. For Model A.1, states with mini-EPA type agencies experience a 5.88 point increase in median AQI score over the policy phase, compared to states without a mini-EPA type agency; for Model A.3, states with mini-EPA type agencies experience a 5.53 point increase in median AQI, compared to states without a mini-EPA type agency. For Model A.2, states with mini-EPA type agencies experience a 4.96 point increase in median AQI score over the policy phase, compared to states without a mini-EPA type agency; for Model A.4, states with mini-EPA type agencies experience a 4.99 point increase in median AQI, compared to states without a mini-EPA type agency.

Fifth, COMPETITION is a dummy variable comparing states with multiple agencies with environmental policy roles to states with a single agency. COMPETITION is only statistically significant in Model A.2 and A.4; it is not included in Model A.3. For Model A.2, states with multiple agencies with environmental policy responsibilities experience a 1.74 point increase in the median AQI score over the policy phase, compared to states with a single agency; for Model A.4, states with multiple agencies experience a 1.70 point increase in the median AQI, compared to states with a single agency. While the coefficient for Model A.1 is statistically insignificant, the directional relationship is consistent which may provide some support for the relationship between multiple agencies and air quality.

Finally, CAPACITY is statistically significant in all four models. For Model A.1, an increase of one point on the institutional capacity index results in a 1.13 point reduction in the median AQI score over the policy phase; for Model A.3, a one point increase on the institutional capacity index results in a 1.22 point reduction in the median AQI. For Model A.2, an increase of one point on the institutional capacity index results in a 1.27 point reduction in the median AQI score over the policy phase; for Model A.4, a one point increase on the institutional capacity index results in a 1.29 point reduction in the median AQI.

It appears these organizational-level variables are important predictors of air quality outcomes, which is supported by previous research. Based on the statistical findings, there is substantive evidence to accept the relationships between centralization of authority, agency type, agency purpose, institutional capacity, and the change in the median AQI score over policy phases. The coefficients and directional relationships remained stable between models. To a lesser extent, there is some evidence to support the relationship formalization of job roles, inter-agency competition, and the change in the median AQI score over policy phases. The coefficients for these variables were statistically insignificant in at least one model. However, the directional relationships between models remain the same, suggesting that it may have some validity. Nevertheless, the results concerning these two variables should be viewed with some skepticism. However, it is evident that organizational factors have a substantive impact on air quality outcomes.

Socio-Political and Economic Factors

The state-level variables include: environmental expenditures per capita (ENV_EXP); Sierra Club members per capita (SIERRA); public opinion on the environment (PUBLIC_OPINION); political culture (INDIVIDUAL, MORAL); gross state product (GSP); percentage of gross state product from utilities and manufacturing industries (GSP%_UM); and initial median AQI score for the policy phase (POLLUTION). First, ENV_EXP is statistically significant in all four models. For Model A.1, a $1000 increase in spending per person in state environmental expenditures results in a 0.04 point reduction in the median AQI score over the policy phase; for Model A.3, a $1000 increase in environmental expenditures results in a 0.04 point reduction in the median AQI. For Model A.2, a $1000 increase in spending per person in state environmental expenditures results in a 0.03 point reduction in the median AQI score over the policy phase; for Model A.4, a $1000 increase in environmental expenditures results in a 0.03 point reduction in the median AQI.

Second, SIERRA is statistically significant in all four models. For Model A.1, increasing Sierra Club membership by one percent of the general state population results in a 1223.19 point decrease in the median AQI score over the policy phase; for Model A.3, a one percent increase in Sierra Club membership results in a 1132.53 point decrease in the median AQI. For Model A.2, increasing Sierra Club membership by one percent of the general state population results in a 1437.31 point decrease in the median AQI score over the policy phase; for Model A.4, a one point increase in Sierra Club membership results in a 1410.68 point decrease in the median AQI.

Third, PUBLIC_OPINION is statistically significant in all four models. For Model A.1, a one point increase in the public environmentalism scale results in a 12.38 point decrease in the median AQI score over the policy phase; for Model A.3, a one point increase in the public environmentalism scale results in a 12.30 point decrease in the median AQI. For Model A.2, a one point increase in the public environmentalism scale results in a 25.26 point decrease in the median AQI score over the policy phase; for Model A.4, a one point increase in the public environmentalism scale results in a 24.19 point decrease in the median AQI.

Fourth, political culture is a dummy variable comparing two cultural types (INDIVIDUAL, MORAL) to a third (TRADITIONAL). INDIVIDUAL is statistically significant in all four models. For Model A.1, states with individualist political cultures experience a 7.19 point decrease in the median AQI score over the policy phase, compared to states with traditional political cultures; for Model A.3, individualist states experience a 6.19 point decrease in the median AQI, compared to traditional states. For Model A.2, states with individualist political cultures experience a 7.53 point decrease in the median AQI score over the policy phase, compared to states with traditional political cultures; for Model A.4, individualist states experience a 6.64 point decrease in the median AQI, compared to traditional states. MORAL is statistically significant in all four models. For Model A.1, states with moralist political cultures experience a 4.37 point decrease in the median AQI score over the policy phase, compared to states with traditional political cultures; for Model A.3, moralist states experience a 3.73 point decrease in the median AQI, compared to traditional states. For Model A.2, states with moralist political cultures experience a 5.17 point decrease in the median AQI score over the policy phase, compared to states with traditional political cultures; for Model A.4, moralist states experience a 4.58 point decrease in the median AQI, compared to traditional states.

Fifth, GSP is statistically significant all four models. For Model A.1, a $1 million increase in gross state product results in a 0.18 point increase in the median AQI score over the policy phase; for Model A.3, a $1 million increase in gross state product results in a 0.17 point increase in the median AQI. For Model A.2, a $1 million increase in gross state product results in a 0.13 point increase in the median AQI score over the policy phase; for Model A.4, a $1 million increase in gross state product results in a 0.13 point increase in the median AQI. The statistical significance at both Level-1 and Level-2 indicate GSP is a viable measure of both socio-economic conditions and coproduction effects.

Sixth, GSP%_UM is statistically significant in all four models. For Model A.1, a one percentage point increase in the percent of the gross state product from the utilities and manufacturing industries results in a 55.72 point decrease in the median AQI score over the policy phase; for Model A.3, a one percentage point increase in utilities and manufacturing industries gross state product results in a 49.50 point decrease in the median AQI. For Model A.2, a one percentage point increase in the percent of the gross state product from the utilities and manufacturing industries results in a 64.62 point decrease in the median AQI score over the policy phase; for Model A.4, a one percentage point increase in utilities and manufacturing industries gross state product results in a 63.53 point decrease in the median AQI. The statistical significance at both Level-1 and

Level-2 indicate GSP&_UM is a viable measure of both socio-economic conditions and coproduction effects.

Finally, POLLUTION is statistically significant in all four models. For Model A.1, a one point increase in the initial median AQI score for a policy phase results in a 0.78 point decrease in the median AQI score over the policy phase; for Model A.3, a one point increase in the initial median AQI results in a 0.76 point decrease in the median AQI. For Model A.2, a one point increase in the initial median AQI score for a policy phase results in a 0.54 point decrease in the median AQI score over the policy phase; for Model A.4, a one point increase in the initial median AQI results in a 0.54 point decrease in the median AQI. The statistical significance at both Level-1 and Level-2 indicate POLLUTION is a viable measure of both socio-economic conditions and coproduction effects.

It appears these state-level variables are important predictors of air quality outcomes, which confirm previous research findings. Based on the statistical findings, there is substantive evidence to accept the relationships between environmental expenditures, gross state product, the utilities and manufacturing industries, existing air pollution, Sierra Club membership, public opinion on the environment, political culture, and the change in the median AQI score over policy phases. The coefficients and directional relationships of these variables remained stable between models. It is evident that socio-political and economic factors have a substantive impact on air quality outcomes.

Policy Learning

The policy phases variables include two dummy variables representing policy phase 1 (PHASE_1) and policy phase 2 (PHASE_2), and comparing those phases to the third policy phase. If policy learning is occurring, geometric collinearity should be present; that is, all three points should be aligned in a row. The alignment would indicate policy stakeholders are refining a set of behavior over time. The advantage of using phase 3 as the point of comparison is the behaviors identified within this phase are those most recent; essentially, the practices in place can be compared to previous practices used. First, PHASE_1 is statistically significant in all four models. For Model A.1, states experienced a 15.26 point decrease in median AQI score over policy phase 1 compared to policy phase 3; for Model A.3, states experienced a 15.39 point decrease in median AQI score over policy phase 1 compared to policy phase 3. For Model A.2, states experienced a 8.09 point increase in median AQI score over policy phase 1 compared to policy phase 3; for Model A.4, states experienced a 7.94 point decrease in median AQI score over policy phase 1 compared to policy phase 3. While the coefficients are statistically significant, the inconsistency in the directional relationships draws into question the magnitude and direction of the relationship between policy phase and air quality.

Second, PHASE_2 is statistically significant in all three models. For Model A.1, states experienced a 13.87 point decrease in median AQI score over policy phase 2 compared to policy phase 3; for Model A.3, states experienced a 14.20 point decrease in median AQI score over policy phase 2 compared to policy phase 3. For Model A.2, states experienced a 4.29 point increase in median AQI score over policy phase 2 compared to policy phase 3; for Model A.4, states experienced a 4.33 point decrease in median AQI score over policy phase 2 compared to policy phase 3. While the coefficients are statistically significant, the inconsistency in the directional relationships draws into question the magnitude and direction of the relationship between policy phase and air quality.

The change in directional relationships is a point of concern between models for understanding policy learning. However, two points provide evidence of the existence of policy learning. First, coefficients in both models are statistically significant indicating the findings are not by chance. While this could be a result of N size, the minimum requirement for a model of 141 groups is estimated at 949 observations at Level-1 (Hofmann, 1997); therefore, the dataset by HLM standards is above the minimum but not enormous enough to provide statistical significance on errant relationships. Second, the first policy phase in both models has the most extreme magnitude, suggesting a stable relationship over time. As both dummy variables are in comparison to policy phase 3, graphing the change in the relationship over the three policy phases would create a line with a single direction. If the most extreme coefficient came from policy phase 2, then the graphical points would not be aligned, rather they would form a V shaped pattern. This would not indicate the further refinement of behaviors across time, but a more haphazard change in behavior. Thus, there is a stable change occurring over time. If policy learning is considered a neutral concept in regards to the direction of the relationship, then the stability of the direction of change provides evidence for its legitimacy in this analysis.

Model Comparison

Based on the Kreft and Leeuw (1998)/Singer (1998) R2, all four models are strong predictors of air quality outcomes, predicting between 51% (Model A.4) and 62% (Model A.1) of residual error. According to the AIC and Kreft and Leeuw (1998)/Singer (1998) R2, Model A.1 is a more effective model than Model A.2. However, the BIC indicates that Model A.2 is the more effective model. On the other hand, according to all three statistics, Model A.3 is a more effective model than Model A.4. Comparing all four models, Model A.3 is the most effective based on the AIC and BIC, but Model A.1 is the most effective based on the Kreft and Leeuw (1998)/Singer (1998) R2 which may be a function of the number of parameters. Based on comparison between models, there is evidence to support direct economic effects on air quality outcomes, over indirect economic effects. This finding lends support to the conclusion that coproduction effects are important conceptual components for shaping policy outcomes.

The OLS models indicate: 1) the directional relationships of the predictors are stable; 2) implementation occurs at multiple levels; and 3) testing implementation factors without a multi-leveled approach conceals the true relationships between predictors and policy outcomes. The OLS findings are presented in Table 8.2. First, the only variables to experience a change in directional relationship are professionalism, formalization, and competition. All other variables did not experience a directional change. However, the coefficients and standard errors were greatly altered for all variables. Second, the R2 indicate that the most effective OLS model (Model A.7) only explains 37% of the residual error in policy outcomes. Cumulatively, the three models taken together explain around 48% of the residual error; however, that does not account for the potential of multicollinearity between variables across models. Therefore, the cumulative predictive power of the OLS models may be less than the additive residual error explained by the models. The least effective HLM model (A.4) explained 51% of variance.

Table 8.2

Ordinary Least Squares (OLS) Models of Air Quality Policy Outcomes

	Model A.5	Model A.6	Model A.7
Level-1			
KNOWLEDGE	-0.13 (0.49)	-	-
SUPPORT	-0.98 (0.58)	-	-
DISCRETION	-0.10 (0.36)	-	-
TRADITION	-0.67 (0.52)	-	-
REPRESENT	0.58 (0.54)	-	-
PROFESSIONAL	-0.42 (0.21)*	-	-
POLLUTION	-	-	-
GSP	-	-	-
GSP%UM	-	-	-
Level-2			
PHASE_1	4.59 (0.72)***	4.57 (2.35)	5.84 (2.22)*
PHASE_2	3.64 (0.68)***	3.45 (2.31)	3.56 (2.05)
CENTRAL	-	-1.17 (4.83)	-
FORMAL	-	-0.60 (5.38)	-
Agency Type	-	-	-
-CRAFT	-	-3.37 (4.24)	-
-PROCEDURAL	-	-4.21 (3.20)	-
-PRODUCTION	-	-6.28 (2.18)**	-
PURPOSE	-	1.49 (2.06)	-
COMPETITION	-	-2.32 (2.07)	-
CAPACITY	-	-0.56 (0.54)	-
ENV_EXP	-	-	-0.02 (0.01)
GSP	-	-	0.08 (0.03)
GSP%UM	-	-	-30.31 (17.18)
POLLUTION	-	-	-0.48 (0.06)***
SIERRA	-	-	-853.28 (809.81)
PUBLIC_OP	-	-	-3.36 (12.27)
Political Culture	-	-	-
-INDIVIDUAL	-	-	-5.15 (2.39)*
-MORAL	-	-	-4.32 (2.44)
Constant	2.15 (3.17)	1.38 (18.49)	32.38 (18.23)
R2	0.005	0.108	0.366
N size (Level-1)	1613	-	-
N size (Level-2)	-	141	141

*p<.05, **p<.01,***p<.001

Thus, the multi-level HLM models are more effective in explaining the variance in the policy outcomes compared to the single-level OLS models. Finally, the lack of viable results from the OLS models indicates the unsuitable nature of the approach for testing implementation models. Of the 27 variables included in the models, only six are statistically significant in the OLS models, while statistically significant findings for every variable except one were produced by the HLM models. Therefore, relying on OLS to test this implementation model would have produced no results, while testing it with HLM has produced substantive and noteworthy results.

Water Quality

The findings of the analysis of the multi-level model for water quality policy outcomes are presented in Table 8.3. The table presents two models: Model W.1, includes indirect economic effects; and, Model W.2, removes the statistically insignificant predictor variable from Model W.1. Therefore, due to insufficient data, the coproduction effects are not tested in the water quality models.

Implementation Decisions

The decision-making variables for front-line operators include: the use of scientific/technical knowledge (KNOWLEDGE); perception of policy support by stakeholders (SUPPORT); degree of discretion (DISCRETION); value of traditional public management role (TRADITION); value of role of public administrators as representatives of the public (REPRESENT); and, degree of professionalism (PROFESSIONAL). The range of change in waterways rated as good is 92.78 to -68.14, with the median at -4.2.

First, KNOWLEDGE is not statistically significant in Model W.1, and not included in Model W.2. Second, SUPPORT is statistically significant in both models. For Model W.1, an increase of one point in the policy support index results in a 28223.03 mile reduction in waterways rated as good over the policy phase; for Model W.2, a one point increase in the policy support index results in a 23920.33 mile reduction in good waterways.

Third, DISCRETION is statistically significant in both models. For Model W.1, an increase of one point in the discretion index results in a 17145.93 mile increase in waterways rated as good over the policy phase; for Model W.2, a one point increase in the policy support index results in a 16945.98 mile increase in good waterways.

Fourth, TRADITION is statistically significant in both models. For Model W.1, an increase of one point in the traditional role index results in a 26635.41 mile reduction in waterways rated as good over the policy phase; for Model W.2, a one point increase in the policy support index results in a 21593.44 mile reduction in good waterways. Fifth, REPRESENT is not statistically significant in Model W.1, and not included in Model W.2.

Finally, PROFESSIONAL is statistically significant in both models. For Model W.1, an increase of one point in the professionalism index results in a 17704.12 mile reduction in waterways rated as good over the policy phase; for Model W.2, a one point increase in the professionalism index results in a 17094.91 mile reduction in good waterways.

Table 8.3

Hierarchical Linear Models (HLM) of Water Quality Policy Outcomes

Fixed Effects	Model W.1	Model W.2
Level-1		
KNOWLEDGE	-1830.16 (8580.04)	-
SUPPORT	-28223.03 (10925.58)**	-23920.33 (10272.11)*
DISCRETION	17145.93 (6509.55)**	16945.98 (6446.52)**
TRADITION	-26635.41 (10092.79)**	-21593.44 (9965.24)*
REPRESENT	8696.80 (10358.25)	-
PROFESSIONA	-17704.12 (8045.43)*	-17094.91 (7941.71)*
L	-61004.61 (32217.44)	-62213.90 (31993.02)*
ASSESS_WATE	-0.09 (0.005)***	-0.08 (0.005)***
R	-473210.92 (50626.73)***	-446705.33 (50866.12)***
TOTAL_WATE		
R		
LAMBDA		
Level-2		
PHASE_1	-707.79 (710.20)	-794.86 (712.85)
PHASE_2	-1004.86 (556.96)	-1135.90 (560.65)*
CENTRAL	-3668.07 (1736.29)*	-3506.97 (1734.03)*
FORMAL	5481.71 (1853.62)**	5113.00 (1871.22)**
Agency Type	-	-
-CRAFT	6032.38 (2326.37)**	6382.31 (2332.13)**
-	7198.61 (1151.09)***	6866.08 (1132.21)***
PROCEDURAL	-2584.78 (765.55)***	-2298.18 (759.93)**
-PRODUCTION	4311.90 (789.33)***	4652.88 (783.54)***
PURPOSE	-2258.51 (802.85)**	-2365.35 (805.23)**
COMPETITION	2473.84 (295.34)***	2367.65 (289.76)***
CAPACITY	-117.66 (17.03)***	-113.34 (17.08)***
ENV_EXP	-3293750.37 (382063.63)***	-3205041.00 (380251.93)***
SIERRA	11553.20 (4141.43)**	12249.04 (4146.35)**
PUBLIC_OP	-	-
Political Culture	-9195.34 (962.72)***	-9019.61 (960.44)***
-INDIVIDUAL	-3308.97 (1125.88)**	-3038.44 (1124.45)**
-MORAL	9.09 (2.31)***	9.08 (2.31)***
GSP	-89704.14 (9588.72)***	-89097.67 (9676.36)***
GSP%_UM	-26.38 (16.27)	-29.99 (16.34)
POLLUTION		
Constant	72159.10 (10695.13)***	67450.40 (10670.64)***
BIC	29608.61	29411.22
AIC	28781.61	28784.38
R2	0.650	0.630
Deviance	28467.61	28546.38292
Parameters	157	119
N size (Level-1)	1433	1433
N size (Level-2)	123	123

*p<.05, **p<.01,***p<.001

Based on the statistical findings, there is substantive evidence to accept the relationships between the perceptions of policy support, bureaucratic discretion, the value of the traditional role, professionalism and the change of waterways rated as good over policy phases. The coefficients and directional relationships remained stable between models. There is not sufficient evidence to accept a relationship between the use of scientific/technical knowledge, the value of the representative role, and water quality. It appears that the basis on which decisions are being made during the implementation process by front-line operators is considerably important in predicting outcomes in water quality policy. While previous models have focused on organizational-level or state-level variables, these findings confirm that individual-level variables should not be overlooked.

Organizational Factors

The organizational-level variables include: centralization of authority (CENTRAL); formalization of job roles (FORMAL); agency type (CRAFT, PROCEDURAL, PRODUCTION); agency purpose (PURPOSE); inter-agency competition (COMPETITION); and institutional capacity (CAPACITY). First, CENTRAL is statistically significant in both models. For Model W.1, an increase of one point in the centralization index results in a 3668.07 mile reduction in the waterways rated as good over the policy phase; for Model W.2, a one point increase in the centralization index results in a 3506.97 mile reduction in good waterways.

Second, FORMAL is statistically significant in both models. For Model W.1, an increase of one point in the formalization index results in a 5481.71 mile increase in the waterways rated as good over the policy phase; for Model W.2, a one point increase in the formalization index results in a 5113.00 mile increase in good waterways.

Third, agency type is a dummy variable comparing three agency types (CRAFT, PROCEDURAL, PRODUCTION) to the fourth (COPING). CRAFT is statistically significant in both models. For Model W.1, states with a craft agency experience a 6032.38 mile increase in waterways rated as good over the policy phase, compared to states with a coping agency; for Model W.2, states with a craft agency experience a 6382.31 mile increase in good waterways, compared to states with a coping agency. PROCEDURAL is statistically significant in both models. For Model W.1, states with a procedural agency experience a 7198.61 mile increase in waterways rated as good over the policy phase, compared to states with a coping agency; for Model W.2, states with a procedural agency experience a 6866.08 mile increase in good waterways, compared to states with a coping agency. PRODUCTION is statistically significant in all four models. For Model W.1, states with a production agency experience a 2584.78 mile reduction in waterways rated as good over the policy phase, compared to states with a coping agency; for Model W.2, states with a production agency experience a 2584.78 mile reduction in good waterways, compared to states with a coping agency.

Fourth, PURPOSE is a dummy variable comparing mini-EPA type agencies to all other agency types. PURPOSE is statistically significant in all four models. For Model W.1, states with mini-EPA type agencies experience a 4311.90 mile increase in waterways rated as good over the policy phase, compared to states without a mini-EPA type agency; for Model A.3, states with mini-EPA type agencies experience a 4652.88 mile increase in good waterways, compared to states without a mini-EPA type agency.

Fifth, COMPETITION is a dummy variable comparing states with multiple agencies with environmental policy roles to states with a single agency. COMPETITION is statistically significant in both models. For Model W.1, states with multiple agencies with environmental policy responsibilities experience a 2258.51 mile reduction over the policy phase, compared to states with a single agency; for Model W.2, states with multiple agencies experience 2365.35 mile reduction in good waterways, compared to states with a single agency.

Finally, CAPACITY is statistically significant in both models. For Model W.1, an increase of one point on the institutional capacity index results in a 2473.84 mile increase in the waterways rated as good over the policy phase; for Model W.2, a one point increase on the institutional capacity index results in 2367.65 mile increase in good waterways.

It appears these organizational-level variables are important predictors of air quality outcomes, which is supported by previous research. Based on the statistical findings, there is substantive evidence to accept the relationships between centralization of authority, job role formalization, agency type, agency purpose, inter-agency competition, institutional capacity, and the change in waterways rated as good over policy phases. The coefficients and directional relationships of these variables remained stable between models. It is evident that organizational factors have a substantive impact on water quality outcomes.

Socio-Political and Economic Factors

The state-level variables include: environmental expenditures per capita (ENV_EXP); Sierra Club members per capita (SIERRA); public opinion on the environment (PUBLIC_OPINION); political culture (INDIVIDUAL, MORAL); gross state product (GSP); percentage of gross state product from utilities and manufacturing industries (GSP%_UM); and the initial miles of waterways rated good for the policy phase (POLLUTION);. First, ENV_EXP is statistically significant in both models. For Model W.1, a $1000 increase in spending per person in state environmental expenditures results in a 117.66 mile reduction in waterways rated as good over the policy phase; for Model W.2, a $1000 increase in environmental expenditures results in a 113.34 mile reduction in good waterways.

Second, SIERRA is statistically significant in both models. For Model W.1, increasing Sierra Club membership by one percent of the general state population results in a 3293750.37 mile reduction in waterways rated as good over the policy phase; for Model W.2, a one percent increase in Sierra Club membership results in a 3205041.00 mile reduction in good waterways.

Third, PUBLIC_OPINION is statistically significant in both models. For Model W.1, a one point increase in the public environmentalism scale results in a 11553.20 mile increase in waterways rated as good over the policy phase; for Model A.3, a one point increase in the public environmentalism scale results in a 12249.04 mile increase in good waterways.

Fourth, political culture is a dummy variable comparing two cultural types (INDIVIDUAL, MORAL) to a third (TRADITIONAL). INDIVIDUAL is statistically significant in both models. For Model W.1, states with individualist political cultures experience a 9195.34 mile reduction in waterways rated as good over the policy phase, compared to states with traditional political cultures; for Model W.2, individualist states experience a 9019.61 reduction in good waterways, compared to traditional states. MORAL is statistically significant in both models. For Model W.1, states with moralist political cultures experience a 3308.97 reduction in waterways rated as good over the policy phase, compared to states with traditional political cultures; for Model W.2, moralist states experience a 3038.44 mile reduction in good waterways, compared to traditional states.

Fifth, GSP is statistically significant both models. For Model W.1, a $1 million increase in gross state product results in a 9.09 mile increase in waterways rated as good over the policy phase; for Model A.3, a $1 million increase in gross state product results in a 9.08 mile increase in good waterways.

Sixth, GSP%_UM is statistically significant in both models. For Model W.1, a one percentage point increase in the percent of the gross state product from the utilities and manufacturing industries results in a 89704.14 mile reduction in waterways rated as good over the policy phase; for Model W.2, a one percentage point increase in utilities and manufacturing industries gross state product results in a 89097.67 mile reduction in good waterways.

Finally, POLLUTION is statistically significant in both models. For Model W.1, a one percentage point increase in the initial waterways rated as good during a policy phase results in a 26.38 mile reduction in waterways rated as good over the policy phase;

for Model W.2, a one percentage point increase in the initial good waterways results in a 29.99 mile reduction in good waterways.

It appears these state-level variables are important predictors of air quality outcomes, which confirm previous research findings. Based on the statistical findings, there is substantive evidence to accept the relationships between environmental expenditures, gross state product, the utilities and manufacturing industries, existing air pollution, Sierra Club membership, public opinion on the environment, political culture, and the change in waterways rated as good over policy phases. The coefficients and directional relationships of these variables remained stable between models. It is evident that socio-political and economic factors have a substantive impact on water quality outcomes.

Policy Learning

The policy phases variables include two dummy variables representing policy phase 1 (PHASE_1) and policy phase 2 (PHASE_2), and comparing those phases to the third policy phase. However, neither policy phase dummy variables proved to be statistically significant. These findings indicate that policy learning may not be occurring for the implementation of water quality policy.

Control Variables

The control variables to account for the differences in state waterway mileage include: the total mileage of state waterways (TOTAL_WATER); the percentage of total state waterways assessed for the CWA self-reported data (ASSESS_WATER); and the Heckman Correction to account for selection bias in assessment of waterways by state agencies (LAMBDA). First, TOTAL_WATER is statistically significant in both models. For Model W.1, a one mile increase in the total state waterways results in a 0.09 mile reduction in waterways rated as good; for Model W.2, a one mile increase in total state waterways results in a 0.08 mile reduction in good waterways. States with more waterway miles are more likely to have a decrease in good waterways over time.

Second, ASSESS_WATER is only statistically significant in Model W.2. For Model W.2, a one percentage point increase in the percent of state waterways assessed results in a 62213.90 mile reduction in waterways rated as good. This finding indicates that the more waterway miles assessed, the more impair or threatened waterway miles reported. Finally, LAMBDA is statistically significant and negative in both models, which suggests that the error terms in the selection and primary equations are negatively correlated. Thus, nobserved factors that make participation more likely tend to be associated with lower mileage of waterways rated as good. Therefore, states are more likely to assess waterways that are rated as impaired or threatened than those that are rated as good.

Model Comparison

Based on the Kreft and Leeuw (1998)/Singer (1998) R2, both models are strong predictors of water quality outcomes, predicting between 63% (Model W.1) and 65% (Model W.2) of residual error. According to the AIC and Kreft and Leeuw (1998)/Singer (1998) R2, Model W.1 is a more effective model than Model W.2. However, the BIC indicates that Model W.2 is the more effective model. There is not sufficient data to compare models with direct and indirect economic effects; therefore, we must rely on the models with indirect economic effects in model comparisons. However, this provides no evidence for the coproduction effects.

The OLS models indicate: 1) the directional relationships of the predictors are stable; 2) implementation occurs at multiple levels; and 3) testing implementation factors without a multi-leveled approach conceals the true relationships between predictors and policy outcomes. The OLS findings are presented in Table 8.2. First, the only variables to experience a change in directional relationship are SUPPORT, DISCRETION, PURPOSE, COMPETITION, ENV_EXP, PUBLIC_OP, INDIVIDUAL, and MORAL. All other variables did not experience a directional change. However, the coefficients and standard errors were greatly altered for all variables.

Second, the R2 indicate that the most effective OLS model (Model W.4) only explains 33% of the residual error in policy outcomes. Cumulatively, the three models taken together explain around 77% of the residual error; however, that does not account for the potential of multicollinearity between variables across models, specifically for the control variables which are included in all three models. Therefore, the cumulative predictive power of the OLS models is most likely much less than the additive residual error explained by the models. The least effective HLM model (W.2) explained 63% of variance. Thus, the multi-level HLM models are competitive with the OLS models in explaining the residual error. Finally, the lack of viable results from the OLS models indicates the unsuitable nature of the approach for testing implementation models. Of the 27 variables included in the models, only nine are statistically significant in the OLS models, while statistically significant findings for every variable except five were produced by the HLM models. Therefore, relying on OLS to test this implementation model would have produced no results, while testing it with HLM has produced substantive and noteworthy results.

Table 8.4

Ordinary Least Squares (OLS) Models of Water Quality Policy Outcomes

	Model W.3	Model W.4	Model W.5
Level-1			
KNOWLEDGE	-390.32 (349.92)	-	-
SUPPORT	199.39 (405.59)	-	-
DISCRETION	-462.29 (255.90)	-	-
TRADITION	-251.51 (369.77)	-	-
REPRESENT	860.07 (386.15)**	-	-
PROFESSION	-680.05 (161.59)***	-	-
ASSESS_WAT	-10905.83(773.36)***	-129.72 (30.19)***	-111.09 (31.83)***
TOTAL_WAT	-.06 (0.003)***	-0.06 (0.02)***	-0.06 (0.2)***
LAMBDA	-125267.1(8684.85)***	-127638.4(30941.4)***	-111966.4(80974.3)
Level-2			
PHASE_1	639.22 (509.24)	869.67 (1659.08)	982.40 (1957.57)
PHASE_2	496.70 (487.13)	681.23 (1623.66)	1151.89 (1851.53)
CENTRAL	-	-4545.71 (3379.82)	-
FORMAL	-	3952.46 (3709.50)	-
Agency Type	-	-	-
-CRAFT	-	6930.52 (3168.65)*	-
-PROCEDURE	-	244.60 (2264.19)	-
-PRODUCT	-	-1602.73 (1612.52)	-
PURPOSE	-	-2079.08 (1469.13)	-
COMPETITION	-	4017.71 (1540.31)**	-
CAPACITY	-	1189.35 (428.61)**	-
ENV_EXP	-	-	5.20 (27.97)
GSP	-	-	7.09 (3.61)*
GSP%_UM	-	-	-18316.4 (16209.8)
POLLUTION	-	-	-35.86 (32.23)
SIERRA	-	-	-772908.7
	-	-	(766977.6)
PUBLIC_OP	-	-	-3395.94 (11288.7)
Political Culture	-	-	-
-INDIVIDUAL	-	-	1538.51 (2115.45)
-MORAL			4111.462 (2217.11)
Constant	20349.62(2430.22)***	22789.98 (12974.66)	24936.63
R2	0.211	0.328	(20938.24)
N size (Level-1)	1433	-	0.229
N size (Level-2)	-	123	-
			123

*p<.05, **p<.01,***p<.001

Conclusions

The analyses of air and water quality have both produced viable findings for the prediction of policy outcomes based on multi-level factors in the implementation process. Both statistically significant and substantively important findings resulted from these analyses. Of the six multi-level models presented, all explained more than half of the residual error in the dependent variables. Additionally, the results indicate a viable relationship between most predictor variables and policy outcomes. The findings suggest several important conclusions for how the implementation process shapes policy outcomes, which will be discussed in detail in the next chapter.

CHAPTER 9

DISCUSSION AND CONCLUSIONS

The intent of this chapter is to discuss the findings of the analysis and present conclusions from this research. The chapter is divided into three parts. First, the results of the analyses presented in the previous chapter will be discussed in terms of the theoretical framework. The findings support many of the theoretical assertions made about the implementation process in previous chapters. Second, conclusions for the practice of public policy and administration are presented. The results of the analyses have several important implications for the practice of implementing environmental policy and for environmental administration. Finally, conclusions for public policy and administration research are presented. The methodological approach and subsequent analyses provide several conclusions about the nature of researching the implementation process and environmental policy outcomes, as well as provide for potential directions for future research.

Comparing Air and Water

The results of the analyses suggest some notable differences in the management of air and water quality. Even though air and water management both fall under the heading of environmental management, they require two different approaches. The difference is a consequence of the physical aspects of air and water quality. Air quality is more homogenous in nature than water quality, with a distribution of pollutants following a fairly uniform pattern over time and space. Air quality efforts can focus on a much broader picture of environmental management. Efforts are not focused on neighborhoods, but on larger metropolitan areas. On the other hand, water quality is more heterogeneous, with the distribution of pollutants being restricted to specific areas. Water quality management must focus on localized efforts for controlling pollutant levels. Efforts are restricted to specific stretches of waterways, rather than on entire rivers. Therefore, the management approaches are necessarily different based on the environmental science of air and water quality.

These differences are highlighted in the comparison across the entire theoretical framework. The relationships between predictor variables and policy outcomes vary on key concepts which define the methods of implementation efforts and program management. The differences in the decision-making of front-line operators are the most distinctive indication of the basic logic of task which is dissimilar for air and water management. However, a similar pattern is dispersed throughout the statistical models. Nevertheless, there are consistent relationships on predictor variables that are relative to aspects of the implementation process which are not affected by the approach to management (i.e., institutional capacity). The findings suggest an interesting commentary on the nature of program implementation and management, not only in environmental policy but in all aspects of public policy and administration.

State Socio-Political and Economic Factors

The results of the analysis of state-level socio-political and economic factors are consistent with some previous research, but are notable due to the comparison between the air and water quality models. First, the socio-political context indicates the broad versus local perspective of environmental concerns results in two distinct patterns for the influence of politics on implementation and program management. Compared to states with traditional cultures, states with individualist and moralist cultures experience improved air quality but reduced water quality over time. Within traditional cultures, the pressure on government is to maintain the status quo and politics are concentrated on local concerns. On the other hand, within individualist and moralist cultures, the pressure on government is to empower the individual or seek the public good, respectively; both of which require a broader perspective on the relationship between policy and outcomes. Additionally, the larger social and geographic context of cultures may have implications. Traditional cultures are more likely to be focused in rural areas, where as individualist and moralist cultures are more likely to be in suburban or urban areas. Rural areas are more likely to have problems with water quality and less likely to have problems with air quality; for suburban and urban areas, the opposite is true. Therefore, traditional cultures concerned with maintaining the status quo are unlikely to be responsive to taking on environmental challenges which do not present a direct threat to the norm; the direct threat being water quality, not air quality. On the other hand, individual and moralist cultures are likely to dedicate resources where they are likely to do the most good, with air quality being the major threat.

Furthermore, the political interest findings suggest a similar pattern. Increased strength of both environmental and economic interests within a state results in better air quality outcomes over time, but worse water quality outcomes. Air quality is a more prominent, broader issue in the political context. In states with strong environmental and/or economic interest groups, the emphasis is on air quality management as the more salient political issue. In states with weaker environmental and/or economic interest groups, the emphasis is more equitability distributed between issues. Water is a localized issue, thus, strong central concern does not equate to support. This is supported by the finding on existing pollution, where higher existing pollution leads to better air quality outcomes but worse water quality outcomes. In states where air quality is more of a pressing issue, more emphasis is placed on creating positive results. On the other hand, water quality fades into the background, and more pollution does not draw more concern. Second, the findings on environmental expenditures suggest an unorthodox relationship. Increased expenditures improve air quality, but reduce water quality. The finding for air quality is fairly straight forward: more resources devoted, means better results. As a salient issue for state-wide politics, air quality benefits from increased resources. The finding for water quality is more complicated. Foremost, water quality as an issue, again, suffers from a lack of salience in the broad political context. Increased environmental expenditures means more resources available, but these resources are devoted to wider issues. Therefore, localized issues, like water quality, may end up with more resources, but less political prominence. In other words, water quality may end up with a larger budget, but less proportional money compared to other environmental issues. Thus, similar to the findings on political context, air quality as a general issue benefits from centralized concern, but water quality as a local issue suffers from the same centralized concern.

Third, public environmentalism has a predictable relationship, where concern for the environment is concern for the environment, regardless of the specific issue. Favorable public opinion results in better air and water quality outcomes. Public environmentalism is much different in effecting environmental program management than interest groups. The public is not concerned with single issues or political agendas; the public only wants a clean environment for human health. Finally, the economic variables capturing coproduction in the air quality models lead to a different set of observations. While the directional relationships are the same, the concept is much different. The coproduction variables support the notion that there is an interaction between the activities of private citizens and management efforts which creates policy outcomes. As measures of socio-political interests, they support the notion that political interests affect policy outcomes. Both are valid concepts and are supported by previous research. The lack of comparison with water quality models does not facilitate a discussion of the difference in broad versus local issues. Based only on the air quality models though, it seems as though the increased industry and pollution improves air quality because it leads to an increased concern for air quality issues in environmental efforts. However, it is difficult to make certain of these assertions, based on the limited data and a potential interaction effect occurring between economic processes and political interests.

These findings on the socio-political and economic context of environmental management are interesting from an academic standpoint for furthering the understanding of the shaping of policy outcomes. With the exception of environmental expenditures, the socio-political and economic contexts are outside of the control of both public officials and managers. Therefore, these findings do not suggest practical implications for creating more efficient and effective environmental policy outcomes. However, it is clear that the context of implementation should not be overlooked in practice or academia.

Organizational Characteristics

The findings on organizational characteristics suggest some noteworthy implications for the effects of organizational structure on policy outcomes and for creating an effective context for policy implementation. As a whole, the organizational variables undoubtedly indicate structure matters in shaping policy outcomes, and by extension organizational performance. Furthermore, organizational structure as the primary context of decision-making is crucial in the implementation process.

First, centralization of authority, formalization of job roles and rules, and agency type are keys in shaping the context of implementation decision-making. Based on the findings, increased centralization of authority within agencies results in improved air quality over time, but reduced water quality. On the other hand, increased formalization of job roles within agencies results in improved water quality over time, but reduced air quality. Therefore, there is important difference in managerial oversight of final decisions versus the process of decision-making. This is undoubtedly related to the broad versus local issue nature of air and water quality. The centralization index essentially measures whether decisions/actions are subject to managerial approval; the formalization index, the process of how decisions are made or actions undertaken. The difference in these concepts is very significant in understanding their effect on policy outcomes. For air quality, increased oversight of final decisions and actions by employees results in better policy outcomes. Additionally, the relationship between centralization and air quality outcomes is much stronger, than for formalization. Conversely, for water quality, increased oversight of the process of how decisions are made results in better policy outcomes. The relationship between formalization and water quality outcomes is much stronger, than for centralization. Therefore, control over the decisions being carried out by employees is the key to producing better air quality, but controlling the decision-making process is the key to producing better water quality.

Second, the findings on agency type follow a similar pattern. The agency typology captures the concern for outcomes versus outputs in program management. For air quality, observing the outcomes is much more important viewing the outputs; for water quality, observing outputs is more important than viewing outcomes. Reinforcing the findings on centralization and formalization, the end result is more important than the process by which it is achieved for air quality, while the process is more important than the end result for water quality. The context of ends versus the means in management of air and water quality clearly makes a difference in outcomes. Air quality management must be focused on the end result with a view towards the big picture, but water quality management must rely on an instrumental rationality in shaping policy outcomes. This difference is most likely precipitated by the mechanisms of pollution, where air pollution comes from identifiable sources (i.e., buring fossil fuels) water pollution comes from a litany of sources that are not easily identified or isolated. Therefore, water quality managers must focus on a process they theorize will deal with unknown sources, while air quality managers are able to make decisions directed at known sources.

Third, the other organizational factors have a more predictable relationship with policy outcomes, and tend to follow along with previous findings by other researchers (see Chapter 4). Interagency competition results in both reduced air quality and water quality over time. Most likely this is a result of the struggle for resources and the fragmenting of program management. With multiple agencies responsible for environmental management, there is a larger struggle for the available resources for environmental protection programs, and environmental management is divided up between agencies leaving room for some things to fall through the cracks. Furthermore, strong institutional capacity results in improved air and water quality over time. Clearly, a greater capacity to respond to change, manage conflict, and make decisions results in better policy outcomes. This finding is by no means surprising, as a greater capacity of states to handle their responsibilities should result in better performance.

On the other hand, agency purpose has opposing effects on air and water quality. Mini-EPA type agencies result in reduced air quality over time, but improved water quality over time. It is likely that niche agencies are much more adept at dealing with air quality, while a broader, more general agency is better at water quality management. Sources of pollution of air quality are more isolated and more easily identified than for water quality. Water quality management can be integrated into management of several programs under the same agency, while it would be more difficult to effectively do so with air quality management. In other words, land quality or toxic waste programs and water management programs may overlap, but the same is not true for air quality.

Therefore, niche agencies are more suitable for air quality management, but general environmental agencies are more suitable for water quality management.

These findings on organizational factors should be important to two groups of people: mid-managers and supervisors; and, agency leaders and elected officials. First, managers and supervisors should recognize how structuring the context of decision-making affects the behavior of front-line operators and shapes policy outcomes. Centralizing authority, formalizing job roles, and structuring agency focus on outcomes and outputs has interesting effects on organizational performance. These are, also, factors that can be controlled by managers and supervisors. While larger factors are outside the control of the mid-level manager, how tightly he controls decision-making in his unit is not. Second, agency leaders and elected officials should recognize how structuring agencies affects policy outcomes. Agency leaders and elected officials do have the control to reform and redesign environmental agencies to become more effective organizations. Redefining purpose, building capacity, and reducing competition are within the power of top-level decision-makers and can improve environmental outcomes.

Decision-making of Front-Line Operators

The findings concerned with decision-making criteria of front-line operators are intriguing. They support the basic assumption of the theoretical framework: decisions from front-line operators are the primary means by which policy outcomes are shaped. However, there are important differences for air and water quality management, which are directly related to the environmental science behind management schemes.

Nevertheless, the findings provide substantial insight into how decisions made by front-line operators effect policy outcomes, and how effective decision-making is derived.

First, the findings concerning the use of scientific/technical knowledge and the use of discretion is particularly interesting in context for the logic of task. Increased knowledge of the scientific and/or technical theory behind the CAA results in better air quality outcomes, but knowledge of theory behind the CWA has no significant relationship with water quality outcomes. The use of discretion in determining violations of federal and state policies results in better air and water quality outcomes. On the surface this seems like a confusing finding. However, when considered with the results from organizational characteristics discussed below, an interesting pattern emerges. Air quality management is based heavily in ends based reasoning; that is working towards a goal. Therefore, managers should have more theoretical knowledge in basing decisions to work towards the goal of improved air quality. Discretion for air quality management empowers the use of knowledge in decision-making. On the other hand, water quality management is based heavily in an instrumental rationality, in which the process must be followed to create improved outcomes. Knowledge of theory is not necessary in following rules. Discretion for water quality management empowers the enforcement of the rules. Air and water quality managers are using discretion towards two different ends, and the use of knowledge plays into this differently.

Second, the findings concerning the perceptions of the role public administrators are very significant in understanding the approach of environmental management efforts. The representative role, as outlined in New Public Administration literature, results in deteriorating air quality, but has no significant relationship with water quality. The traditional role, as outlined in Public Management literature, results in deteriorating water quality, but has no significant relationship with air quality. However, the lack of statistically significant results should be viewed as an issue in determining the exact nature of the relationship, not a complete absence of a relationship. The different relationships between the public administration role and types of environmental program management are not surprising at this point. For air quality, the focus on representation and social equity creates a handicap to seeing the big picture. Specifically, concern with the individual effects of implementation decisions blurs the end goal. However, the traditional role does not necessarily help clarify the big picture. Efficient and effective ends do not always mean better air quality, especially in states without large environmental concerns. Therefore, the traditional role is more of a question mark in effecting air outcomes than the representative role.

For water quality, the focus on efficiency and effectiveness creates a handicap in the process rational and the localized management efforts. In particular, the process rationale requires full attention be granted to the process regardless of the big picture. Furthermore, the localized efforts make judging efficiency and effectiveness in outcomes difficult, as there are multiple levels of analysis on which to judge. However, the representative role does not necessarily result in a better process. Too large of a concern on equity, interferes with effectively accomplishing individual goals (i.e., some local projects will have to take precedence over others), but this approach may be useful in states with a diversity of environmental concerns. Thus, the representative role has mixed results with water quality outcomes. There is likely an interaction effect between available resources, environmental concerns, and the role of the public administrators (the traditional role for air quality and the representative role for water quality) which is not accounted for in the analyses. While the results do not indicate the proper approach of the public administrator in seeking better environmental outcomes, they do suggest the improper role, which is still important in informing practice and theory.

Third, the relationship of perceptions of support for environmental policy is consistent with that of the political interest findings. Increased support leads to better air quality, but poorer water quality. Again, this is likely the result of centralized support benefiting air quality as the more salient, general issue, and deterring water quality as a localized issue. It is important to note that the survey items focus on support on general environmental policy, and not specifically on air or water quality. Thus, this does not suggest that increased support for water quality results in poorer water quality, but increased support for environmental efforts results in poorer water quality. While this is just an extension of the political interest findings, the more intriguing indication is that front-line operators are well aware of the political environment surrounding them. The consistency in the relationship between perceptions of support and measured support suggests that there is an accurate perception of the political context of by implementers. This further supports the notion that political context is effecting the decision-making of implementers and program managers.

Finally, in the most surprising finding, professionalism results in poorer air and water quality. The professionalism index measures professional activity and training, not the characteristics or qualities of a professional. The relationship between policy outcomes and professionalism suggests that effective environmental management cannot be taught in the classroom or in conferences. It is likely, then, effective environmental management stems from experiential learning. Specifically, classroom training as a public manager or environmental scientist is likely less important to successful policy outcomes as on-the-job training and experience. Therefore, traditional coursework is not sufficient to effectively prepare environmental managers for their jobs in policy implementation and program management.

The findings on decision-making criteria are significant in their support for the role of front-line operators in shaping policy outcomes. The decisions made by those implementing and managing environmental programs are having important and noteworthy effects on environmental conditions. Furthermore, these findings on decision-making criteria should be important to those in the trenches of air and water quality management. Whether in supervisor or a front-line operator role, these findings have significant implications for the approach to environmental management which yields the greatest success. While the specifics differ for air and water, there is practical knowledge that can assist public managers in achieving more success in environmental policy outcomes. Redefining or reinforcing effective approaches by front-line operators to environmental management can facilitate better environmental conditions.

Policy Learning

The results concerning policy learning are not simple. For air quality, the policy phase dummy variables do indicate a stable directional relationship over time. However, when the economic effects are changed from direct to indirect the relationship changes from negative to positive. There are two considerations to take into account in interpreting this finding, though. First, policy learning should be considered a neutral statement in terms of effecting policy outcomes. Learning to be bad at a job is still learning. Those involved in the policy process do not necessarily have to learn to create better policy outcomes for learning to occur. In other words, implementers may learn to "game the system" over time in order to gain resources or political capital. This may be a clear case of the principal-agent problem in which implementers may seek a different set of goals than their political principals. Nevertheless, the air quality findings do show policy learning is occurring; the confusion is a result of isolating what is being learned.

Second, the economic variables represent two distinct concepts in this case: socio-economic conditions, and coproduction effects. When modeled as indirect effects, the economic variables are attempting to capture the state socio-economic conditions; when modeled as direct effects, they are capturing the coproduction effects of economic processes on environmental conditions. Both concepts are theoretically important in analyzing policy outcomes and the implementation process. This is a limitation in this research, but it is simply in the nature of environmental policy. With another policy area, socio-economic conditions and coproduction could be modeled with a separate set of variables. Thus, when interpreting policy learning, when the coproduction effects are considered and a less developed operationalization of the socio-economic effects is used, implementers are learning to become more effective over time. However, when coproduction is not considered and a more developed operationalization of the socio-economic effects is used, implementers are learning to become less effective over time. This is a conflicting finding. Nevertheless, there is evidence to suggest policy learning is occurring in air quality management.

For water quality, the policy phase dummy variables are neither statistically significant nor are they directionally stable over time. This suggests that policy learning has not occurred in water quality management. This finding is as important as the finding for air quality, though. The lack of policy learning means that water quality managers are not effectively making changes to their implementation schemes over time. However, the coproduction effects were not modeled due to insufficient data; therefore, only the socio-economic effects are considered.

The absence of policy learning in water quality management is likely the result of the local nature of management and a lack of effective data on policy outcomes available to managers. First, due to the physical aspects, air quality is centrally managed, but water quality is local. Therefore, policy outcomes can more effectively be matched with implementation behavior in air quality than in water quality. Second, more detail is devoted to this below, but briefly there is a dearth of reliable, available data on water quality data over time that can be aggregated across jurisdictional boundaries. Water quality officials may know individually the cross-sectional conditions of waterways, but not have the necessary data to determine the overall health of a state's waterways or changes over time. Therefore, they cannot effectively match implementation behavior with outcomes, and make adjustments accordingly. Theoretically, effective program evaluation is a key component to policy learning; that is, without knowing the consequences of an action, there is no way to know how changes will affect outcomes. In effect, the local nature of water quality results in managers acting without knowing whether it results in widespread benefits or harms to waterways. On the other hand, this data does exist for air quality, which may explain why policy learning occurs there. In sum, policy learning is a murky subject. It occurs, but only if "learning" is considered as a neutral term, not suggesting improvements on any single measure of performance. Additionally, in the absence of sufficient data on policy outcomes, it most likely does not occur. Thus, in analyzing policy outcomes, the principal-agent problem and the availability of information on outcomes are two issues to be considered.

Testing the Theoretical Framework

The theoretical framework developed for the analysis of implementation has proven very useful in capturing how and why policy outcomes are shaped. There is solid evidence to support both the general framework and the specific application to the CAA and CWA. The general theoretical framework effectively captured the many components of the implementation process. The substantive importance and statistical significance found across both levels of the model suggest there is substantial evidence that there are multi-level effects on policy outcomes in the implementation process. Furthermore, there is similar evidence supporting each individual concept modeled within the framework. Thus, there is support for the basic assumption that decisions from front-line operators are the primary catalyst for shaping policy outcomes, but these decisions are significantly affected by the context in which they occur. The general framework can and should be applied to other policies and programs to further test its capacity for explanation and prediction.

The application to the CAA and CWA provided valuable insight into the implementation of federal environmental policy by the states. This as a whole supports the application of the theoretical model to the implementation of federal environmental policy. However, it should be noted that while the models as a whole are effective in explaining the variance, there still remains unexplained variance. Theoretically this is the failure of variable specification in capturing concepts, rather than failure of the general framework to explain the process. Variable specification was, of course, complicated by the dual use of economic variables as both indicators of socio-economic factors and coproduction factors. Application in other instances may be able to avoid similar issues. Nevertheless, the statistical analyses provide ample evidence to accept the theory of the implementation of the CAA and CWA presented in previous chapters.

The strength of the general framework is that it can be effectively adapted to explain various policies, which provide it with general hypotheses but specificity for individual programs. While the application of the framework was supported by the evidence from both the air and water quality analyses, again, it is the differences between air and water that are important. In this instance, they highlight the need for specifying the variables with regard to particular concerns connected to programs. The water quality models are much more effective in explaining the variance in water policy outcomes. This should not be interpreted as the theoretical framework is better at explaining water policy outcomes, though. Only the variables specified in the model are. The theoretical framework has effectively explained the implementation of both policies, but the variables specified are much more important for water than air. Thus, a better attempt at specification can be levied. In sum, the explanatory and predictive power of the theoretical framework of implementation utilized in this research is substantial and noteworthy. Furthermore, the application to the CAA and CWA provides significant insight into air and water quality management.

Multi-Level Modeling in Implementation Research

As researchers in education, sociology, as well as many other disciplines, have all ready determined through empirical research, organizations function in a hierarchical system. Furthermore, investigating these hierarchical systems requires statistical analysis techniques which are capable of modeling multi-level effects. The implementation process functions in a hierarchical system, with factors at multi-levels influencing both policy outcomes and other predictor variables. Policy theorists have been viewing the implementation process as hierarchical in form since the beginning of the second generation of implementation research. Van Meter and Van Horn (1975), in one of the original implementation models, create a multi-level model of the process, as does Sabatier and Mazmanian (1980). While these are both top-down models, bottom-up models rely on the similar base assumption of multi-level effects on policy outcomes.

However, implementation researchers have a tendency to test these models as single-level effects. There is both a theoretical and practical problem to doing so. Theoretically, the research design and the theoretical models do not match up, which creates grave implications for any conclusions that can be drawn from the empirical findings. Practically, aggregating data to a single level creates problems with the specification of a statistical model, which may further complicate the validity of the empirical findings. Nevertheless, hindsight is 20/20. The vast majority of the studies making this mistake were done before the development of sophisticated, reliable analysis techniques for multi-level models, and the corresponding software packages to make it possible. Since the late 1990s, the prevalence of HLM has increased in all social sciences, including public administration. As a whole these studies show, processes that function in organizations must be empirically tested at multiple levels to properly specify a model. Understanding organizational performance hinges on the use of multi-level models (Heinrich and Lynn, 2000; Roderick, 2000; O'Toole, 2000).

The empirical findings of this research are a sound example of the need for multi-level testing of implementation models. The multi-level models of air and water quality prove to be both substantively important and statistically significant on multiple accounts. The results of the HLM analyses suggest interesting and insightful conclusions for the implementation of environmental policy. On the other hand, the single-level models of air and water quality have little significance, either statistically or substantively. The results of the OLS analyses suggest essentially nothing of note. In comparison, the directional relationships of individual predictors between the multi- and single-level models remain fairly consistent, but the statistical significance and substantive importance is obscured in the single-level models. Looking at the results, the keen observer can conclude the problem with the results of the single-level models is they neglect the cross-level effects occurring within the implementation process. The only way to capture such effects is within a multi-level statistical model.

Connecting Practice and Theory

The state politics approach is not new to the analysis of environmental efforts and policy outcomes. The inclusion of some organizational components has been done before, as well. The contribution this research makes is the use of several predictor variables that go beyond the context and into the approach to implementation and program management. In doing so, the findings connect research and practice to provide theoretical guidance to the practitioners. Therefore, there are certain notable conclusions for creating a best practices model of environmental management. First, the socio-political context is outside the control of government, but certain organizational characteristics are within the research of top-tier public officials. Building institutional capacity and reducing interagency competition are keystones to support the mission of environmental management across issues. Redefining agency missions to coincide with the goals of environmental efforts and the strategic concerns should be another focal point. However, redefining agency missions should be done with concern for the differences this may have across environmental issues.

Second, mid and low-level managers, as well as front-line operators, may find significant success in manipulating the approach to management to better correspond with the nature of environmental issues. For air quality managers, they should view air as a broad issue and focus on the big picture, not the little things. Thus, they should structure the implementation environment to focus on end decisions and policy outcomes. Additionally, they should empower front-line operators with technical knowledge and discretion in the field. For water quality managers, they should view water as a local issue and focus on the process rationale, not the policy outcome. Therefore, they should structure the implementation environment to focus on the following rules and work outputs. Furthermore, they should empower front-line operators with discretion, but not handicap the process with excess concerns. In general, environmental managers should seek experiential training over the classroom, and be continue to be aware of how the political environment shapes the implementation process.

Third, the role of public administrators is still very much controversial. It seems neither the traditional role nor the representative role is wholly beneficial to environmental management efforts; though, the wrong role can be harmful. A review of the descriptive statistics of the survey results does indicate a split between role acceptances. Further analysis indicates an intermingling of components and concerns, with a lack of distinction between administrative roles all together (Fowler, 2013). The division in the descriptive statistics highlights the controversy, but the findings from the analyses indicate the sheer complexity inherent in defining the role of public administrators. What can be said is: the role must adapt to the task under management. In other words, air cannot be managed in the same way as water, and vice versa. Therefore, there is not one right role of the public administrator.

Fourth, it seems one of the more interesting implications of these findings is the effects of the logic of task on management schemes and policy outcomes. This element would surely had been lost if it were not for the comparison between air and water quality, and their innate scientific differences. Through and through, this research has indicated the logic of task is paramount in defining the method of undertaking work. Regardless of superficial similarities, the defining characteristic for approaching the work of public policy and administration must be derived from the natural structure of that task. The basic dichotomy of which is outcomes versus outputs; or, ends versus means. It is within this logic that the essence of decision-making and understanding of work comes. Therefore, a misguided logic to approaching a task of management will surely end with effectual outcomes and unrealized dreams.

Finally, based on the previous two points, the principles of administration must be reconsidered. Long ago, the champions of the principles of administration were dealt a deadly blow by Herbert Simon when he proclaimed the principles nothing more than proverbs (Simon, 1946). Simon's claim was that for any principles one could easily find a contradictory principles. The findings here prove just that point, but there is more to the story. Using this research to create sweeping general principles of environmental management would result in contradiction and malfunction. However, seeing air and water quality as different areas of management reveals two distinct sets of management principles.

What these findings indicate is that within any specific task there is an independent logic and context which dictate their own principles. In other words, there are principles of air quality management, but these principles cannot be applied to water quality management or broadly to environmental management; these principles only apply to air quality. Similarly, within any given task of public administration, a set of principles may be derived to achieve the desired results. Here the desired result is a decrease in the annual AQI for the worst metropolitan area within each state and a increase in the waterways rated as good under the CWA self-reported assessments. Other desired results will require an alternative logic of task. The principles of administration can exist, but they are much more complicated than a few sweeping observations of management. They must be localized to the specific task being undertaken, and consider the context of decision-making. This is by far one of the more contentious points being drawn from this research. However, the findings indicate decision-making criteria (i.e., principles of administration) do have drastic implications for policy outcomes, and these decision-making criteria differ between management areas. Clearly, further research and analysis is necessary to further explore these principles, but this does provide a starting point for doing so.

Data on Environmental Policy Outcomes

The biggest obstacle in pursuing this research is also one of the most disturbing: the lack of data on state-level environmental outcomes. Since the 1970's, billions of dollars has been invested in maintaining and improving environmental quality in the US. Two of the keystone pieces of legislation for doing so, CAA and CWA, are almost wholly managed by the states. However, we have no reliable measure of the progress, or lack thereof, occurring at the state level. There are no clear cut measures for holding jurisdictions responsible for environmental conditions. In the cases of the CAA and CWA, states are the primary jurisdiction for enforcement, but no reliable, accurate measure of state-wide air or water quality exists. State-level analyses are important to determine how the whole of jurisdictional efforts are affecting policy outcomes. Otherwise, a great inequity of environmental enforcement efforts may transpire, where jurisdictions only focus on the areas being monitored while ignoring all others.

Only a state-wide measure of environmental outcomes is capable of capturing the effects of program management efforts on actual environmental outcomes. However, measures meeting the necessary criteria simply do not exist. The dependent variables used in this research were the next best options available. It should be noted that it would not have been determined that these were the best alternatives if it were not for a great devotion of time, an unwillingness to change research directions, and a little innovative thinking, as well as guidance from someone (Dr. Gerald A. Emison) with more than three decades worth of practitioner and academic expertise in environmental policy. Thus, these measures were not chosen lightly, nor were they easy to discover.

For air quality, there is no measure for a state-wide comparison. The next best alternative was to focus on the air quality monitoring sites with the worst index ratings; presumably, these would be the areas with the most concentration of state efforts for environmental management. However, this is not a perfect measure, and potentially overlooks peripheral concerns of air quality management within state jurisdictions. For water quality, there is essentially no reliable measure for tracking surface waterway quality over time. The USGS maintains a database of water pollutant concentrations; however, the measurements are taken at different sites and on different pollutants over time. Therefore, there is no good way to track changes in water quality. The next best alternative available was the self-reported state waterway rating reports under the CWA. However, as proven in the analysis, these reports are highly subject to selection bias of waterways. The waterways rated in these reports have not been randomly selected and, therefore, provide a biased and inaccurate view of state waterway quality. Only by correcting for this was the analysis able to move forward. Nevertheless, the Heckman correction, while statistically valid, is based on many assumptions, which may or may not play out in the real world. Thus, the picture of state water quality may be leaving out important considerations.

To properly understand the effects of environmental policy and program management on environmental outcomes, jurisdictional based measures of policy outcomes must be developed as an alternative to the more convenient geographically based measures more commonly used today. These measures should be reliable, accurate, readily available to researchers, and aggregated to meet the jurisdictional boundaries of the management authority; in the case of the CAA and CWA, the states. As long as these measures are not available to policy researchers, there will remain an incomplete picture of the relationship between policy, management, and outcomes.

Future Research Directions

The results of this research should serve as a starting point for future research search in several areas. First, the general theoretical framework should be applied to other programs and policies to determine its full capacity to predict and explain the implementation process. Application to other policies should be done carefully and fully consider how each individual concept within the model should be operationalized. The socio-political factors effecting environmental policy are much different than those effecting education policy. The variables chosen for CAA and CWA models were identified based on both a theoretical and practical understanding of environmental management. Thus, researchers should be meticulous in choosing predictor variables to fit within the applied model. This is particularly true when considering the decision-making criteria of front-line operators. The general theoretical framework has a lot of potential to capture the implementation process, but needs to be further tested.

Second, many implementation scholars have noted the role of front-line operators (Van Meter and Van Horn, 1975) or street-level bureaucrats (Lipsky, 1980), though they have most readily relied on case studies to model the effects (Lipsky, 1980). This research has gone beyond that and attempted to statistically model how bureaucrats make decisions, and the consequence of those decisions. Future researchers should continue to try to capture how bureaucrats are making decisions, and create both theoretical and statistical models of these approaches to public management. The findings here suggest the decision-making criterion used by implementers have significant effects on policy outcomes. By understanding the decisional basis which yields the best outcomes, better guidelines for practitioners can be developed, and moves toward effectual principles of administration can begin. Thus, researchers should attempt to better understand how decision-making by public managers occurs in practice, not just normatively.

Third, implementation and program management occurs in hierarchical setting. When analyzing these processes, techniques that can effectively capture multi-level effects must be utilized. The findings here reveal that the relationship between predictors and policy outcomes at all levels of the model were hidden within single-level models, but revealed in multi-level models. If single-level models would have been relied on, several important relationships and observations about the implementation process would have been overlooked or rejected. Furthermore, the entirety of this research project would have been dismissed as a failure. Only through the use of hierarchical linear modeling could the implementation process be effectively captured in the analysis. Therefore, implementation models must continue to use multi-level analysis techniques to properly test the relationship between outcomes and predictors.

Finally, more effective measures of policy outcomes in environmental policy should be developed. These models should be scientifically accurate, reliable across areas, readily available for researchers, and be aggregated to the jurisdictional level. The AQI is a good starting point for air quality, but can only capture what is happening in specific metropolitan areas, not the entirety of the state jurisdiction. On the other hand, the CWA self-reported assessments somewhat meet these criteria, but they suffer greatly from selection bias. While air and water management does not always fall discretely into state borders, the jurisdiction of implementation authorities does. To best understand how implementation behavior corresponding to outcomes, they must be measured on the jurisdictional level. Otherwise, the picture of environmental management efforts can and will become biased by multi-management areas and the overlapping jurisdictions. The end result is a lack of understanding of how to create better environmental outcomes.

Conclusion

This research has been interesting and fulfilling to undertake. The end results will hopefully better inform both theory and practice of public policy and administration. The theoretical foundation and sophisticated methodology yielded important conclusions for the future of implementation research. These conclusions will hopefully spark further research into these issues and result in a better understanding of the implementation process. The findings concerning organizational characteristics and decision-making criteria are particularly important for the practice of public policy and administration. These findings go beyond conventional observations about the relationship between political context and policy outcomes, and provide insight into how better policy outcomes can be created by practitioners, without additional resources or great political changes. In conclusion, this research should be noted by academics and practitioners alike due to its contributions to the understanding of the implementation process and environmental management.

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APPENDIX A

AIR QUALITY DATA BY STATE, PHASE

Table A.1

Air Quality Data per State per Year

State	Monitoring Site	Years Included	Phase
Alabama	Birmingham-Hoover	2002 - 2010	1,2,3
Alaska	Fairbanks	2002 - 2010	1,2,3
Arizona	Phoenix-Mesa-Scottsdale	2002 - 2010	1,2,3
Arkansas	Little Rock-North Little Rock-	2002 - 2010	1,2,3
	Conway	2002 - 2010	1,2,3
California	Riverside-San Bernardino-Ontario	2002 - 2010	1,2,3
Colorado	Denver-Aurora	2002 - 2010	1,2,3
Connecticut	Bridgeport-Stamford-Norwalk	2002 - 2010	1,2,3
Delaware	Philadelphia-Camden-Wilmington	2002 - 2010	1,2,3
Florida	Tampa-St Petersburg-Clearwater	2002 - 2010	1,2,3
Georgia	Atlanta-Sandy Springs-Marietta	2002 - 2010	1,2,3
Hawaii	Honolulu	2002 - 2010	1,2,3
Idaho	Boise City-Nampa	2002 - 2010	1,2,3
Illinois	Chicago-Naperville-Joliet	2002 - 2010	1,2,3
Indiana	Evansville	2002 - 2010	1,2,3
Iowa	Davenport-Moline-Rock Island	2002 - 2010	1,2,3
Kansas	Kansas City	2002 - 2010	1,2,3
Kentucky	Evansville	2002 - 2010	1,2,3
Louisiana	Baton Rouge	2002 - 2010	1,2,3
Maine	Portland-South Portland-Biddeford	2002 - 2010	1,2,3
Maryland	Philadelphia-Camden-Wilmington	2002 - 2010	1,2,3
Massachusetts	Boston-Cambridge-Quincy	2002 - 2010	1,2,3
Michigan	Detroit-Warren-Livonia	2002 - 2010	1,2,3
Minnesota	Minneapolis-St Paul-Bloomington	2002 - 2010	1,2,3
Mississippi	Memphis	2002 - 2010	1,2,3
Missouri	St Louis	2002 - 2010	1,2,3
Montana	Billings	2002 - 2010	1,2,3
Nebraska	Omaha-Council Bluffs	2002 - 2010	1,2,3
Nevada	Las Vegas-Paradise	2002 - 2010	1,2,3
New Hampshire	Boston-Cambridge-Quincy	2002 - 2010	1,2,3
New Jersey	Philadelphia-Camden-Wilmington	2002 - 2010	1,2,3
New Mexico	Albuquerque	2002 - 2010	1,2,3
New York	New York-Northern New Jersey	2002 - 2010	1,2,3
North Carolina	Charlotte-Gastonia-Concord	2002 - 2010	1,2,3
North Dakota	Bismarck	2002 - 2010	1,2,3
Ohio	Cincinnati-Middletown	2002 - 2010	1,2,3
Oklahoma	Tulsa	2002 - 2010	1,2,3
Oregon	Portland-Vancouver-Beaverton	2002 - 2010	1,2,3

Table A.1 (Continued)

State	Monitoring Site	Years Included	Phase
Pennsylvania	Philadelphia-Camden-Wilmington	2002 – 2010	1,2,3
Rhode Island	Providence-New Bedford-Fall River	2002 - 2010	1,2,3
South Carolina	Columbia	2002 - 2010	1,2,3
South Dakota	Rapid City	2002 - 2010	1,2,3
Tennessee	Knoxville	2002 - 2010	1,2,3
Texas	Houston-Sugar Land-Baytown	2002 - 2010	1,2,3
Utah	Salt Lake City	2002 - 2010	1,2,3
Vermont	Bennington	2002 - 2010	1,2,3
Virginia	Richmond	2002 - 2010	1,2,3
Washington	Seattle-Tacoma-Bellevue	2002 - 2010	1,2,3
West Virginia	Weirton-Steubenville	2002 – 2010	1,2,3
Wisconsin	Milwaukee-Waukesha-West Allis	2002 – 2010	1,2,3
Wyoming	Gillette		

APPENDIX B

WATER QUALITY DATA BY STATE, PHASE

Table B.1

Water Quality Data per State per Year

State	Phase 1	Phase 2	Phase 3
Alabama	2004-2006	2004-2008	2006-2010
Alaska	2002-2006	2004-2008	2006-2010
Arizona	2002-2004	2004-2008	-
Arkansas	2002-2004	2004-2008	-
California	2002-2004	-	-
Colorado	2002-2006	2004-2008	2006-2010
Connecticut	2002-2006	2004-2008	2006-2010
Delaware	2002-2010	2004-2008	-
Florida	2002-2006	2004-2006	2002-2010
Georgia	2002-2006	2004-2008	2006-2010
Hawaii	2002-2008	-	-
Idaho	2002-2006	2002-2008	2008-2010
Illinois	2002-2006	2004-2008	2006-2008
Indiana	2002-2006	2004-2008	2006-2010
Iowa	2002-2006	2004-2008	2006-2010
Kansas	2002-2006	2004-2008	2006-2008
Kentucky	2002-2006	2004-2008	2006-2010
Louisiana	2002-2006	2004-2008	2006-2010
Maine	2002-2006	2004-2008	2006-2010
Maryland	-	-	-
Massachusetts	2002-2006	2004-2006	2006-2010
Michigan	2002-2006	2004-2008	2006-2010
Minnesota	2002-2006	2004-2008	2006-2010
Mississippi	2002-2006	2004-2008	2006-2010
Missouri	2002-2006	2004-2008	2006-2008
Montana	2002-2006	2004-2008	2006-2010
Nebraska	2002-2006	2004-2008	2006-2010
Nevada	2002-2006	2004-2006	-
New Hampshire	2002-2006	2004-2008	2006-2010
New Jersey	2002-2006	2004-2008	2006-2010
New Mexico	2002-2006	2004-2008	2006-2010
New York	2002-2006	2004-2008	2006-2010
North Carolina	2004-2006	2004-2008	2006-2010
North Dakota	2002-2006	2004-2008	2006-2010
Ohio	2002-2006	2004-2008	2006-2010
Oklahoma	2002-2006	2004-2008	2006-2010
Oregon	2002-2006	-	-
Pennsylvania	2002-2006	-	-
Rhode Island	2002-2006	2004-2008	2006-2010
South Carolina	2002-2006	2004-2008	2006-2010

Table B.1 (Continued)

State	Phase 1	Phase 2	Phase 3
South Dakota	2002-2006	2004-2008	2006-2010
Tennessee	2002-2006	2004-2008	2006-2010
Texas	2002-2006	2004-2008	2006-2010
Utah	2002-2006	2004-2008	2006-2008
Vermont	2002-2006	2004-2008	2006-2008
Virginia	2002-2006	2004-2008	2006-2010
Washington	-	2004-2008	-
West Virginia	2002-2006	2004-2008	2006-2010
Wisconsin	2002-2006	2004-2006	-
Wyoming	2002-2006	2004-2008	2006-2010

APPENDIX C

STATE-BY-STATE RESPONSE RATE

Table C.1

State-by-State Survey Response Rate

State	Count	Rate	State	Count	Rate
Alabama	6	7.5%	Montana	17	21.25%
Alaska	21	26.25%	Nebraska	13	16.25%
Arizona	15	18.75%	Nevada	16	20.0%
Arkansas	12	15.0%	New Hampshire	13	16.25%
California	10	12.5%	New Jersey	1	1.25%
Colorado	17	21.25%	New Mexico	12	15.0%
Connecticut	8	10.0%	New York	7	8.75%
Delaware	13	16.25%	North Carolina	8	10.0%
Florida	0	0.0%	North Dakota	14	17.5%
Georgia	4	5.0%	Ohio	9	11.25%
Hawaii	14	17.5%	Oklahoma	19	23.75%
Idaho	9	11.25%	Oregon	14	17.5%
Illinois	9	11.25%	Pennsylvania	3	3.75%
Indiana	14	17.5%	Rhode Island	13	16.25%
Iowa	5	6.25%	South Carolina	4	5.0%
Kansas	8	10.0%	South Dakota	9	11.25%
Kentucky	11	13.75%	Tennessee	7	8.75%
Louisiana	17	21.25%	Texas	11	13.75%
Maine	24	30.0%	Utah	16	20.0%
Maryland	8	10.0%	Vermont	8	10.0%
Massachusetts	14	17.5%	Virginia	17	21.25%
Michigan	17	21.25%	Washington	6	7.5%
Minnesota	23	28.75%	West Virginia	8	10.0%
Mississippi	29	36.25%	Wisconsin	13	16.25%
Missouri	1	1.25%	Wyoming	21	26.25%

APPENDIX D

PRE-SURVEY NOTIFICATION EMAIL

Dear (Survey Participant),

I am a Ph.D. candidate at Mississippi State University. Currently, for my dissertation, I am conducting research that investigates the relationship between implementation decision-making and organizational factors on policy outcomes. The purpose of this research is to determine if certain organization cultural and/or structural components lead to more effective organizational outcomes. In a few days from now you will receive by email a request to fill out an online survey related to this research.

I am writing in advance because many people like to know ahead of time that they will be contacted. Your participation will greatly enhance this research.

Thank you for your time and consideration. It's only with the generous help of public servants like you that a project of this kind can be successful.

Sincerely,

Luke Fowler
Doctoral Student
Department of Political Science and Public Administration
P.O. Box PC
310 Bowen
Mississippi State, MS 39762
lfowler@pspa.msstate.edu

APPENDIX E

SURVEY COVER EMAIL

Dear (Survey Participant):

I am a Ph.D. candidate at Mississippi State University. Currently, for my dissertation, I am conducting research that investigates the relationship between implementation decision-making and organizational factors on policy outcomes. The purpose of this research is to determine if certain decision-making criteria and/or organizational structural components leads to more effective organizational outcomes. I am asking you to participate in the study by completing a survey. Your expertise an organizational member will greatly benefit this research. While this survey is aimed at employees of environmental agencies, an expertise in environmental policy or management is not necessary; only work experience within an environment agency is necessary.

If acceptable, I would like you to complete the survey, by following the attached link to the online survey tool. The survey will last approximately 15 minutes, and will ask a series of questions regarding structure, culture, and decision-making within your agency. You will not have to answer any questions you do not wish to answer. The survey will be conducted completely online, and instructions will be provided throughout the survey. Only I, and my dissertation committee chair, will have access to the information collected from you. The online survey tool will automatically transcribe your responses, and I will personally remove all identifiers after downloading the data. The following link will open the online survey tool:

[LINK TO ONLINE SURVEY]

There are no anticipated risks, compensation or other direct benefits to you as a participant in this research. Your participation is voluntary, and you are free to withdraw your consent to participate and may discontinue your participation in the survey at any time without consequence. If you decide to participate, your participation indicates your consent.

If you have any questions about this research project, please feel free to contact Luke Fowler at lfowler@pspa.msstate.edu

For additional information regarding your rights as a research participant, please contact the MSU Regulatory Compliance Office at 662.325.3994.

Sincerely,

Luke Fowler
Doctoral Student
Department of Political Science and Public Administration
P.O. Box PC
310 Bowen
Mississippi State, MS 39762
lfowler@pspa.msstate.edu

APPENDIX F

SURVEY REMINDER EMAIL

Dear (Survey Participant),

[Last week/A few weeks ago/Last month] an online survey was emailed to you. If you have already completed and submitted the questionnaire, please accept my sincere thanks. If not, I encourage you to respond and will be especially grateful for your help. The survey will last approximately 15 minutes, and will ask a series of questions regarding structure, culture, and decision-making within your agency. You will not have to answer any questions you do not wish to answer. The survey will be conducted completely online, and instructions will be provided throughout the survey. Only I, and my dissertation committee chair, will have access to the information collected from you. The online survey tool will automatically transcribe your responses, and I will personally remove all identifiers after downloading the data. The following link will open the online survey tool:

[LINK TO ONLINE SURVEY]

I am a Ph.D. candidate at Mississippi State University. Currently, for my dissertation, I am conducting research that investigates the relationship between implementation decision-making and organizational factors on policy outcomes. The purpose of this research is to determine if certain decision-making criteria and/or organizational structural components leads to more effective organizational outcomes. I am asking you to participate in the study by completing a survey. Your expertise an organizational member will greatly benefit this research. While this survey is aimed at employees of environmental agencies, an expertise in environmental policy or management is not necessary; only work experience within an environment agency is necessary.

There are no anticipated risks, compensation or other direct benefits to you as a participant in this research. Your participation is voluntary, and you are free to withdraw your consent to participate and may discontinue your participation in the survey at any time without consequence. If you decide to participate, your participation indicates your consent. If you have any questions about this research project, please feel free to contact Luke Fowler at lfowler@pspa.msstate.edu.

For additional information regarding your rights as a research participant, please contact the MSU Regulatory Compliance Office at 662.325.3994.

Sincerely,

Luke Fowler
Doctoral Student
Department of Political Science and Public Administration
P.O. Box PC
310 Bowen
Mississippi State, MS 39762
lfowler@pspa.msstate.edu

APPENDIX G

ONLINE SURVEY SCREENSHOTS

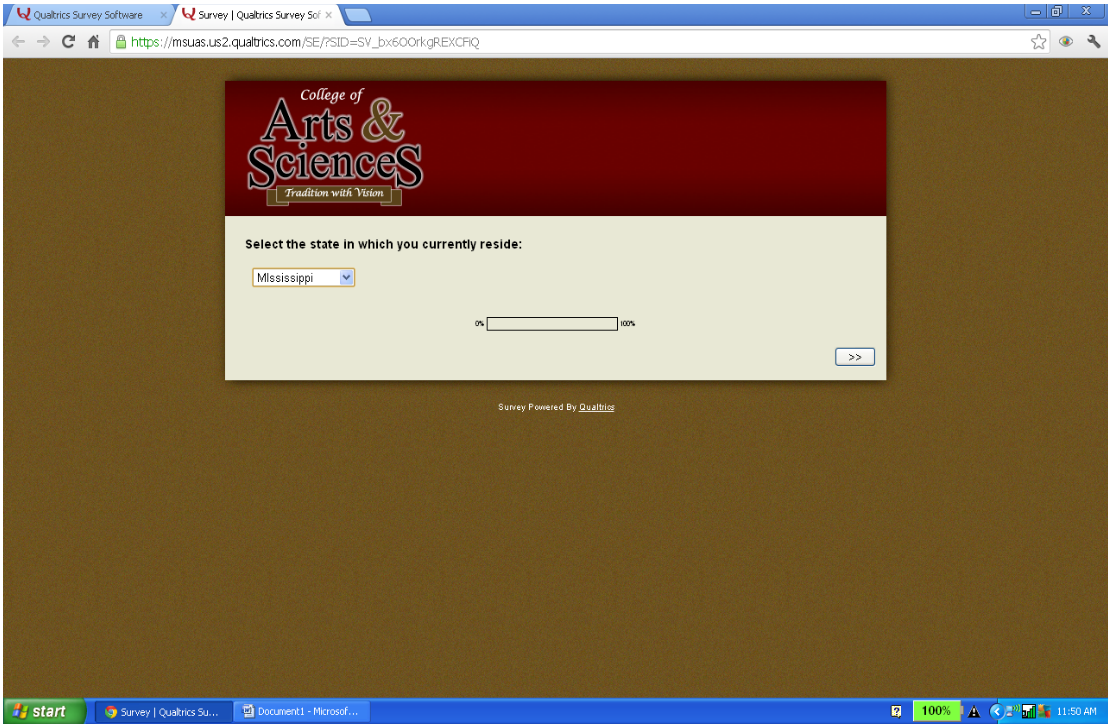


Figure G.1.

State of Employment Survey Question

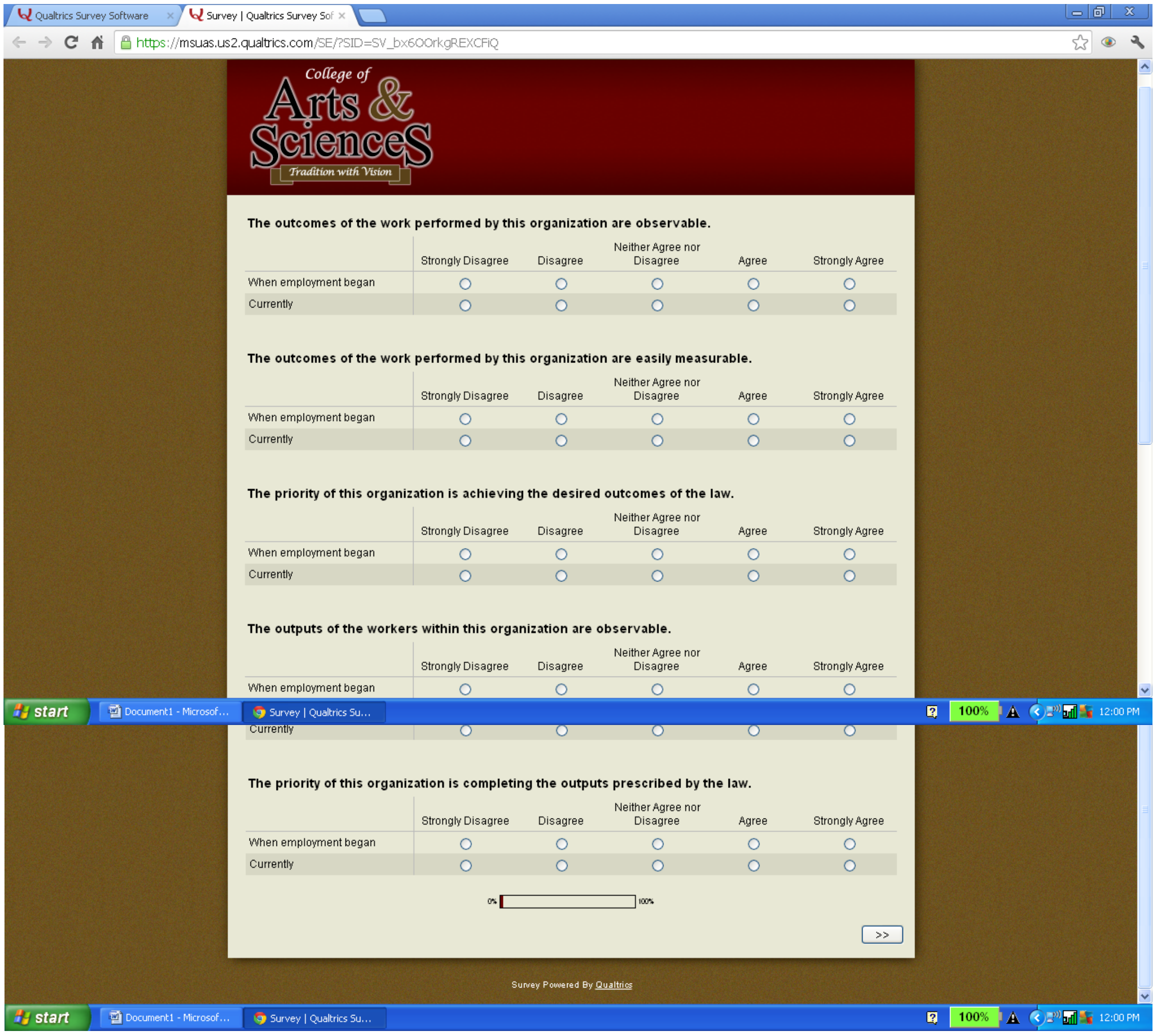
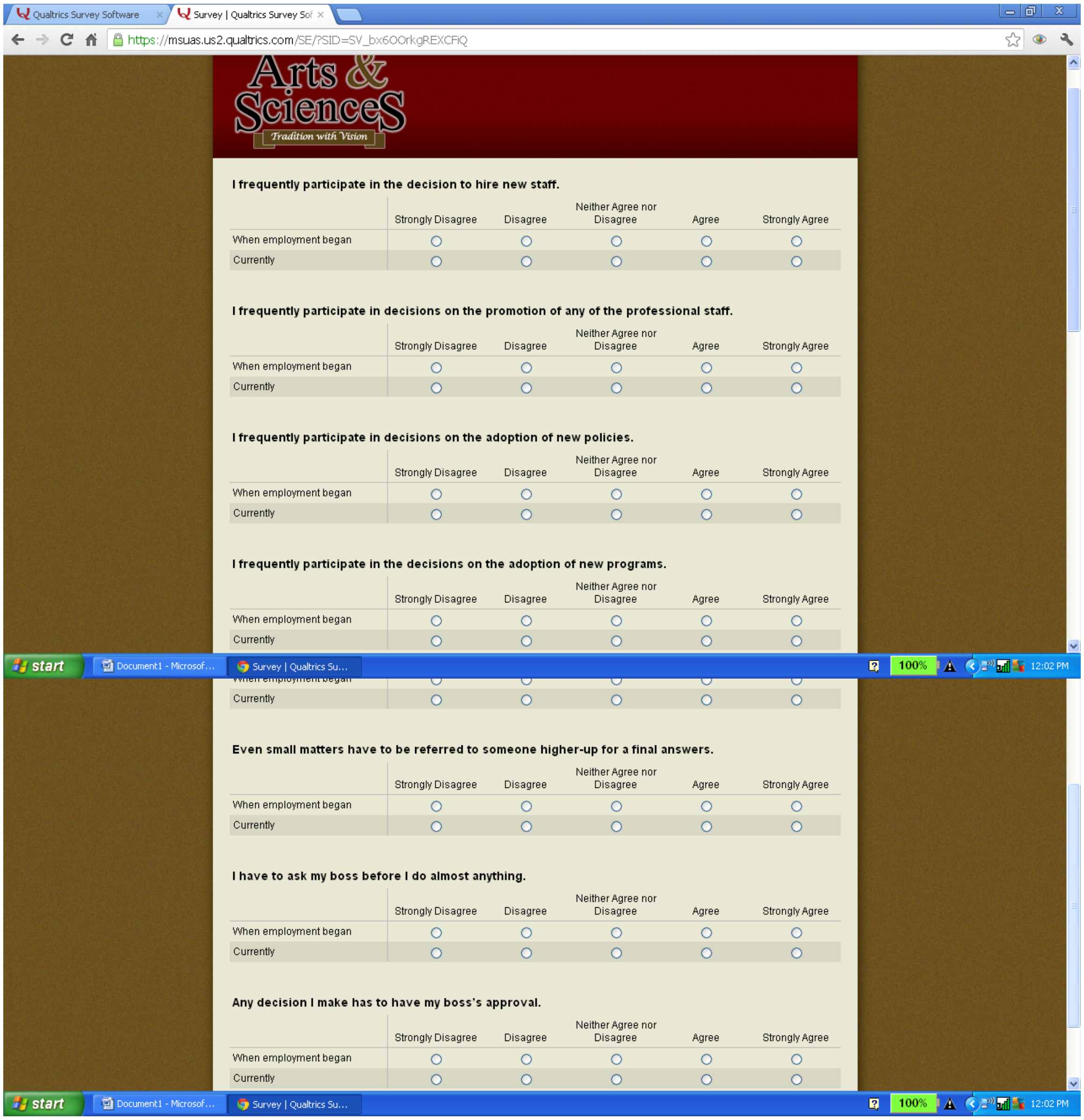


Figure G.2.

Wilson’s Agency Type Survey Questions



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https://msuas.us2.qualtrics.com/SE/?SID=SV_bx6OOrkgREXCFIQ

Arts & Sciences
Tradition with Vision

I frequently participate in the decision to hire new staff.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
When employment began	○	○	○	○	○
Currently	○	○	○	○	○

I frequently participate in decisions on the promotion of any of the professional staff.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
When employment began	○	○	○	○	○
Currently	○	○	○	○	○

I frequently participate in decisions on the adoption of new policies.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
When employment began	○	○	○	○	○
Currently	○	○	○	○	○

I frequently participate in the decisions on the adoption of new programs.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
When employment began	○	○	○	○	○
Currently	○	○	○	○	○

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When employment began	○	○	○	○	○
Currently	○	○	○	○	○

Even small matters have to be referred to someone higher-up for a final answers.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
When employment began	○	○	○	○	○
Currently	○	○	○	○	○

I have to ask my boss before I do almost anything.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
When employment began	○	○	○	○	○
Currently	○	○	○	○	○

Any decision I make has to have my boss's approval.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
When employment began	○	○	○	○	○
Currently	○	○	○	○	○

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Figure G.3

Centralization Survey Questions

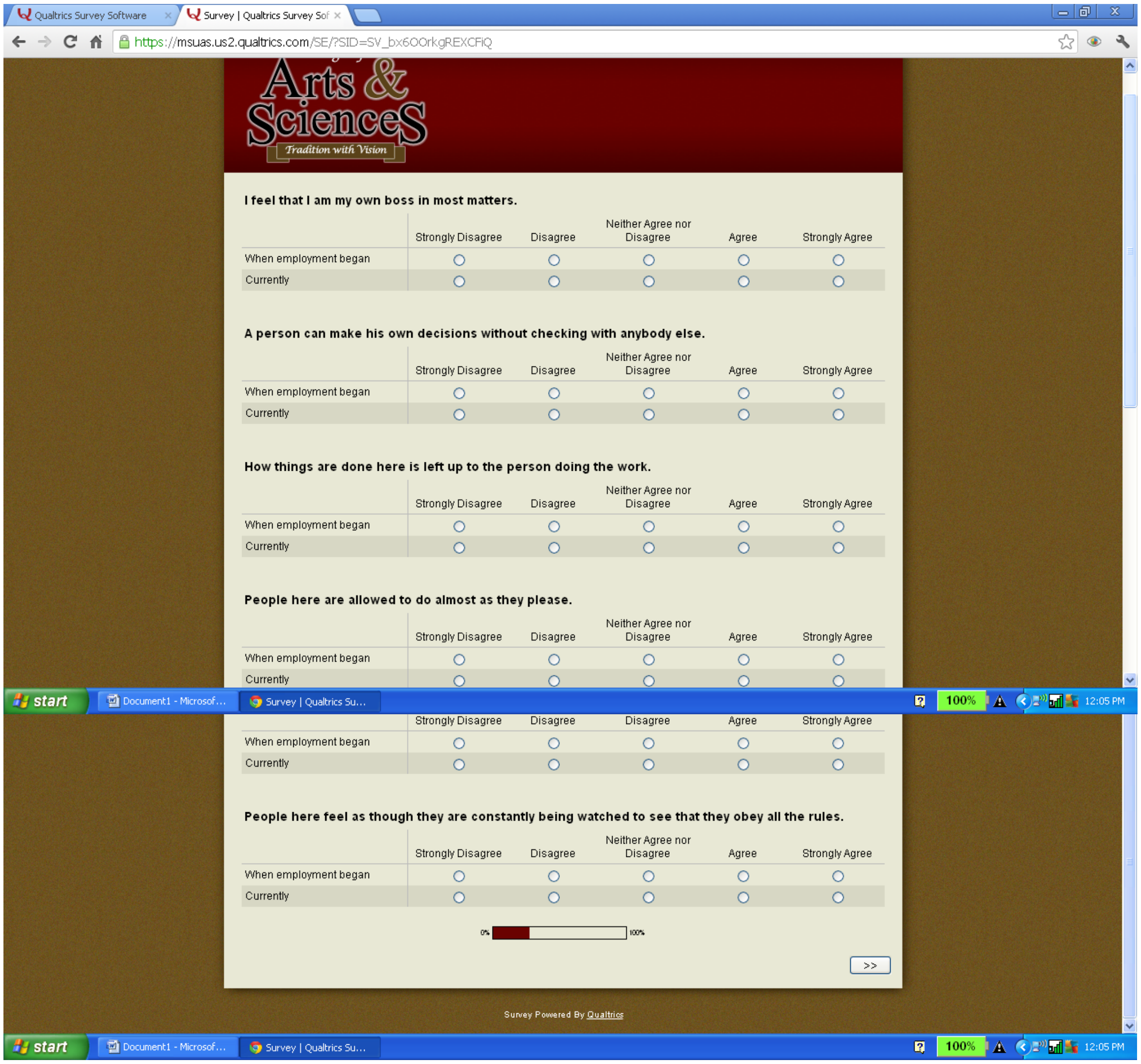


Figure G.4

Formalization Survey Questions

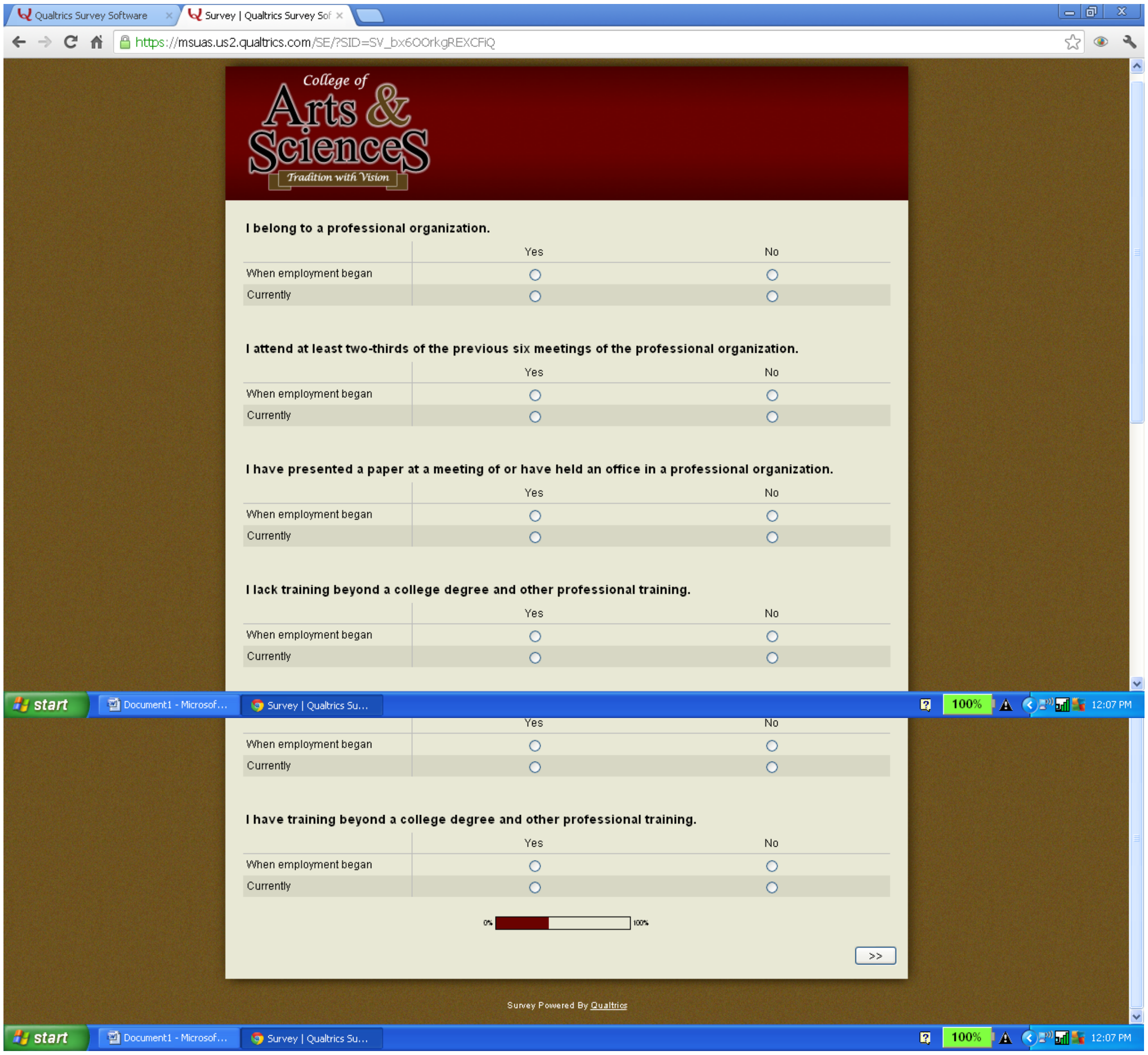
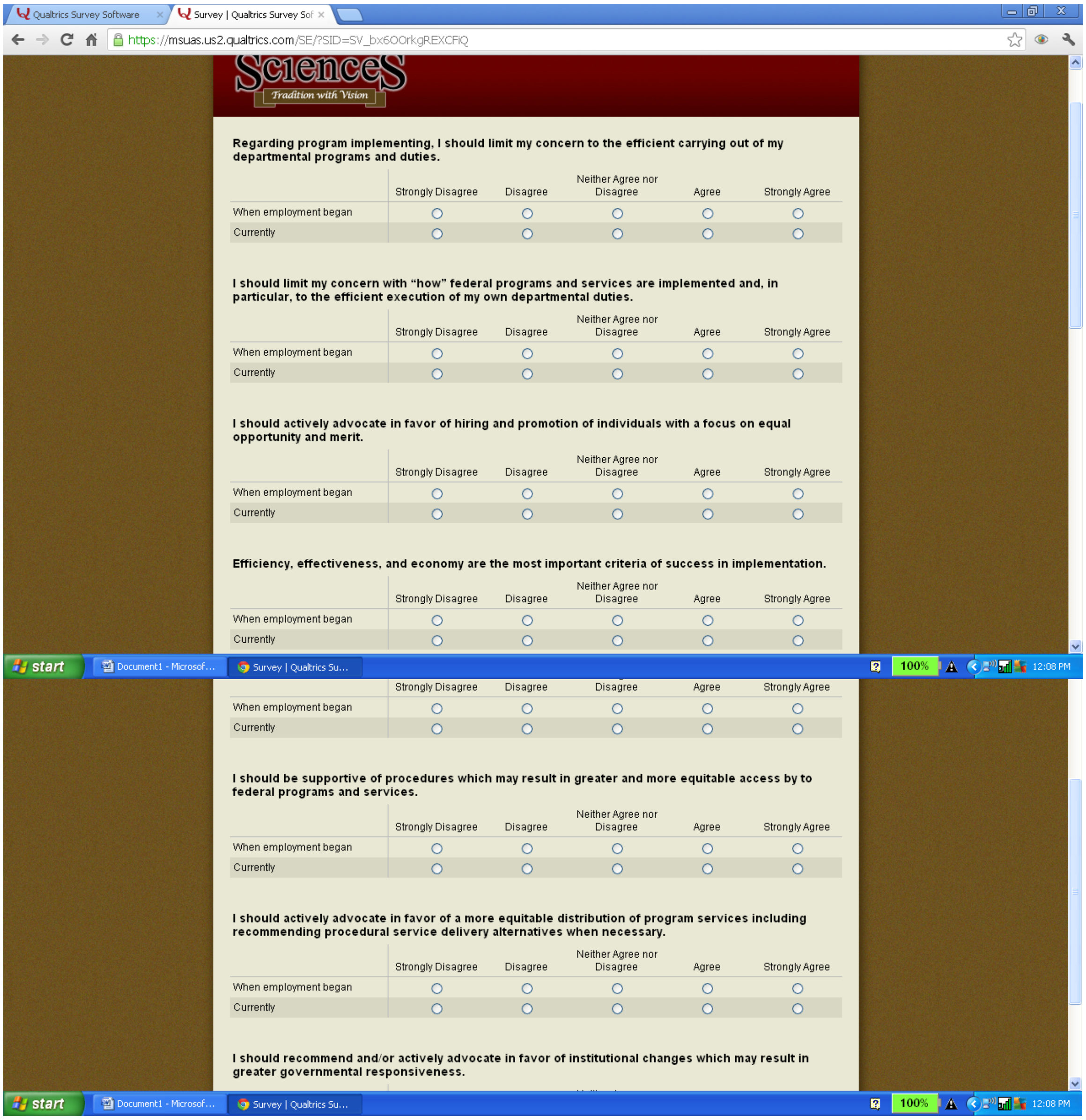


Figure G.5

Professionalism Survey Questions



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Sciences
Tradition with Vision

Regarding program implementing, I should limit my concern to the efficient carrying out of my departmental programs and duties.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
When employment began	○	○	○	○	○
Currently	○	○	○	○	○

I should limit my concern with "how" federal programs and services are implemented and, in particular, to the efficient execution of my own departmental duties.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
When employment began	○	○	○	○	○
Currently	○	○	○	○	○

I should actively advocate in favor of hiring and promotion of individuals with a focus on equal opportunity and merit.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
When employment began	○	○	○	○	○
Currently	○	○	○	○	○

Efficiency, effectiveness, and economy are the most important criteria of success in implementation.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
When employment began	○	○	○	○	○
Currently	○	○	○	○	○

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	Strongly Disagree	Disagree	Disagree	Agree	Strongly Agree
When employment began	○	○	○	○	○
Currently	○	○	○	○	○

I should be supportive of procedures which may result in greater and more equitable access by to federal programs and services.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
When employment began	○	○	○	○	○
Currently	○	○	○	○	○

I should actively advocate in favor of a more equitable distribution of program services including recommending procedural service delivery alternatives when necessary.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
When employment began	○	○	○	○	○
Currently	○	○	○	○	○

I should recommend and/or actively advocate in favor of institutional changes which may result in greater governmental responsiveness.

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Figure G.6

Traditional Role and Bureaucratic Representation Survey Questions

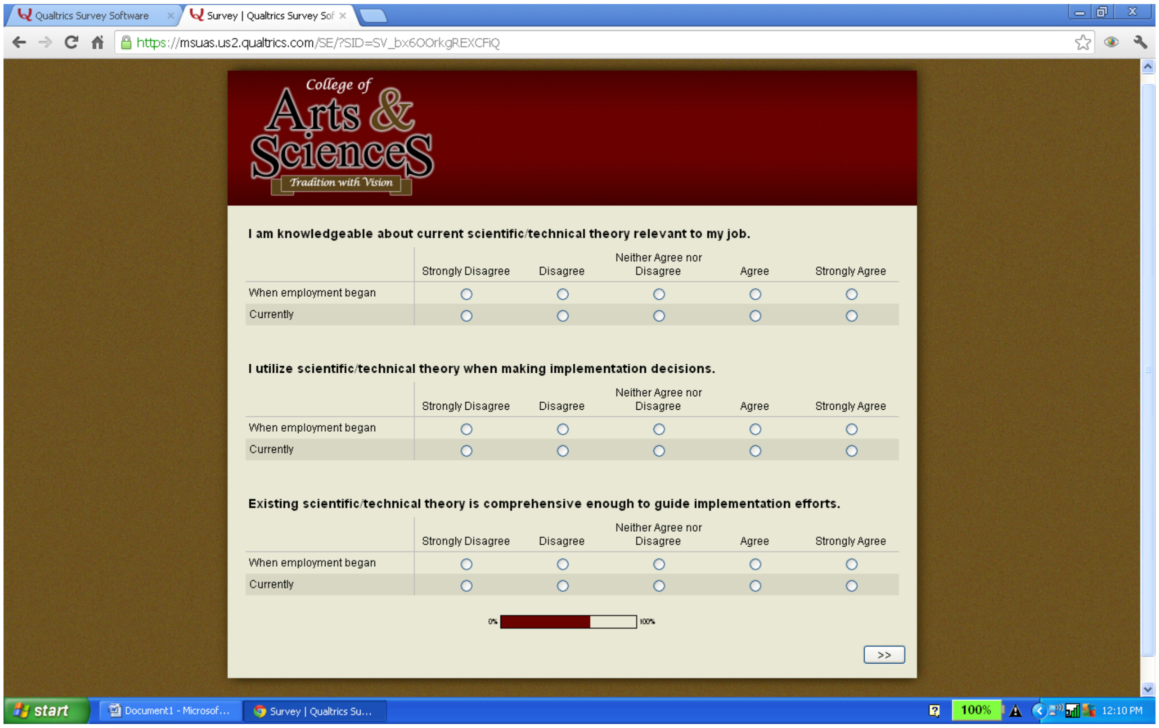

Figure G.7

Use of Scientific/Technical Theory Survey Questions

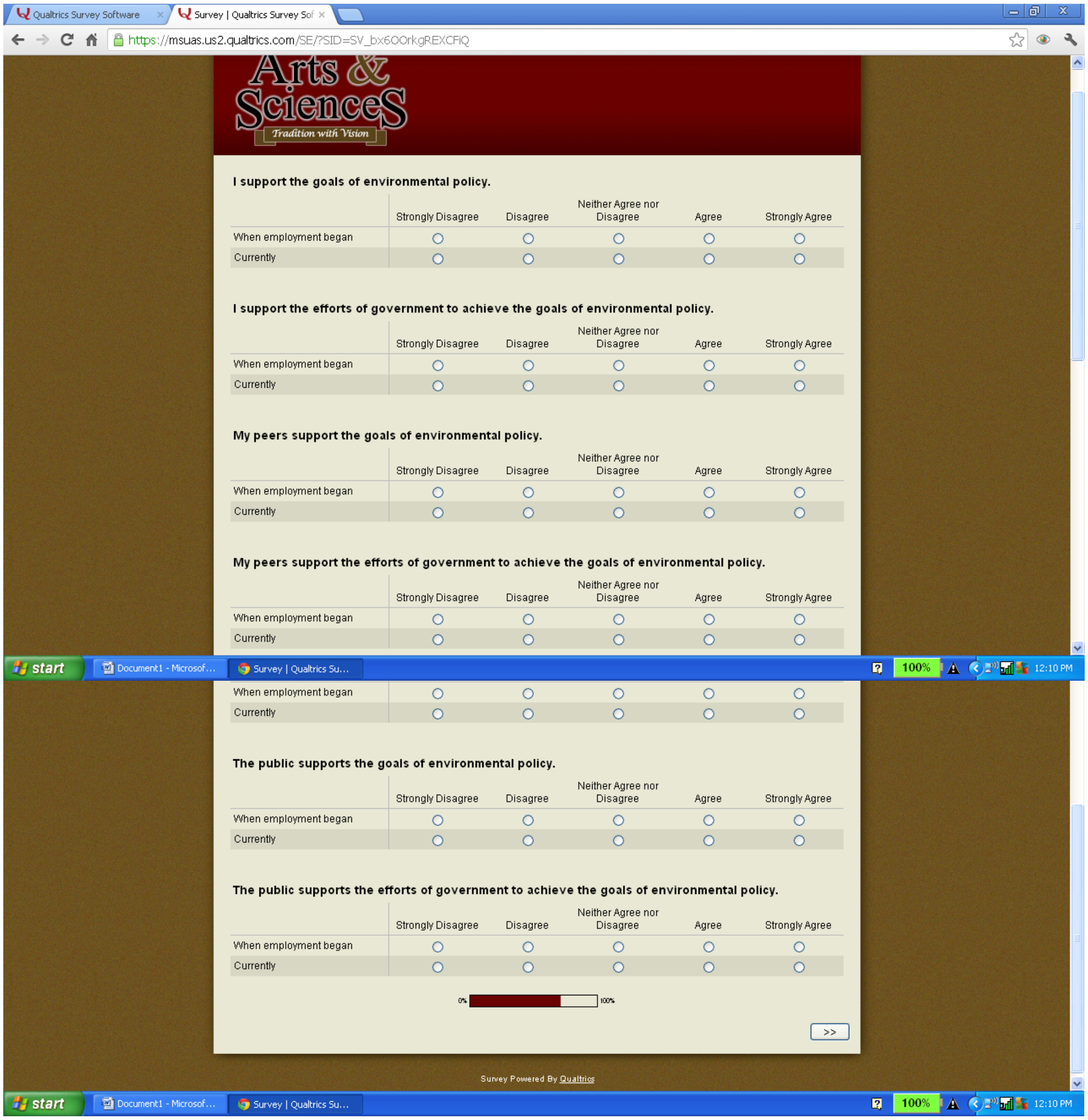

Figure G.8

Perceptions of Support Survey Questions

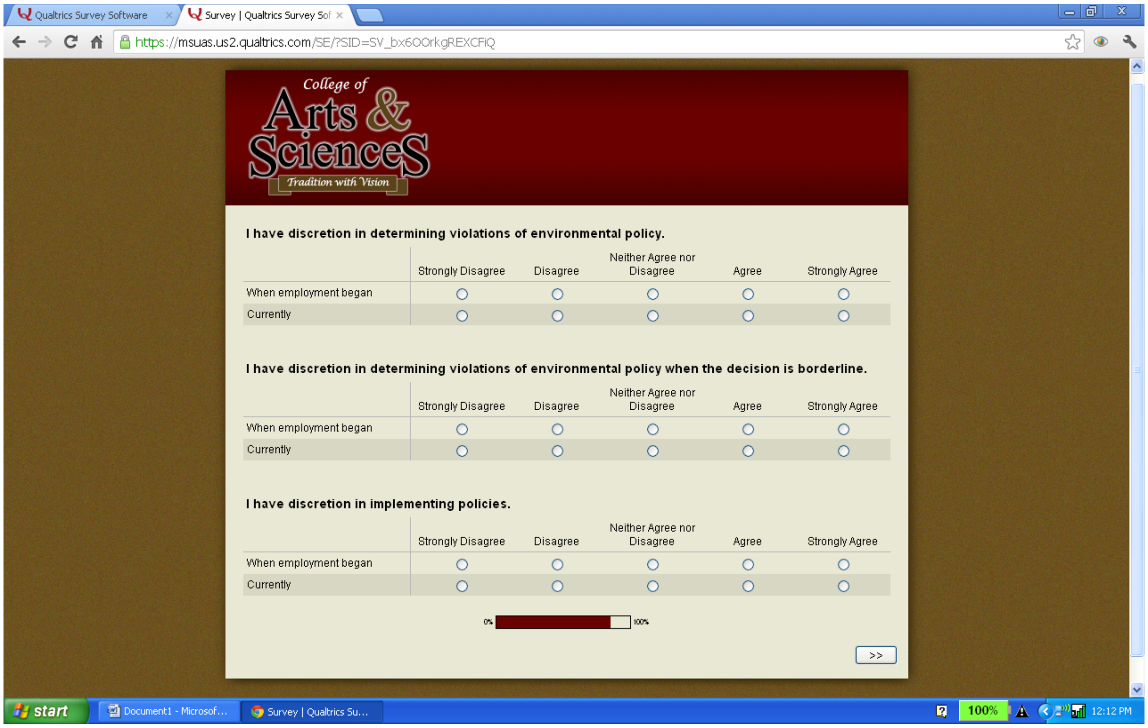

Figure G.9

Administrative Discretion Survey Questions

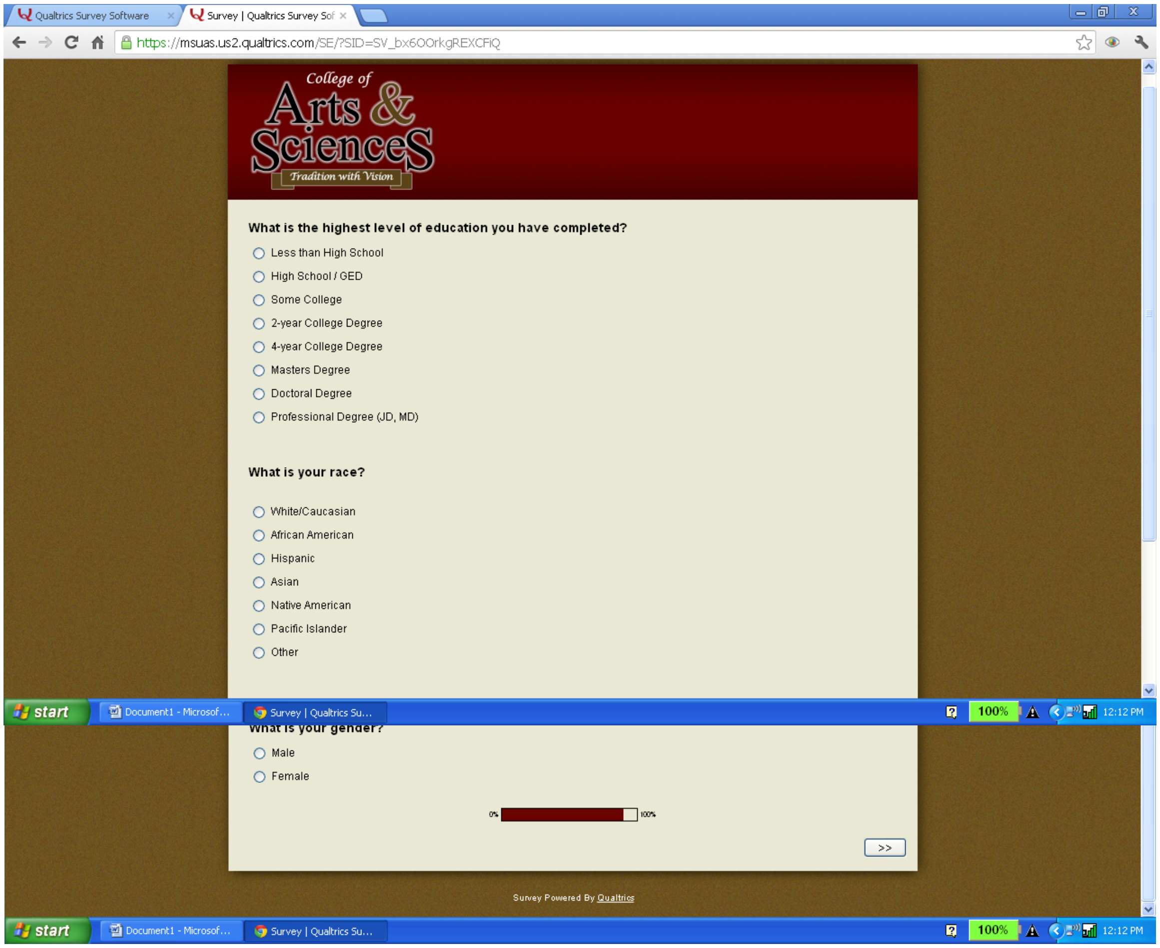

Figure G.10

Demographic Survey Questions

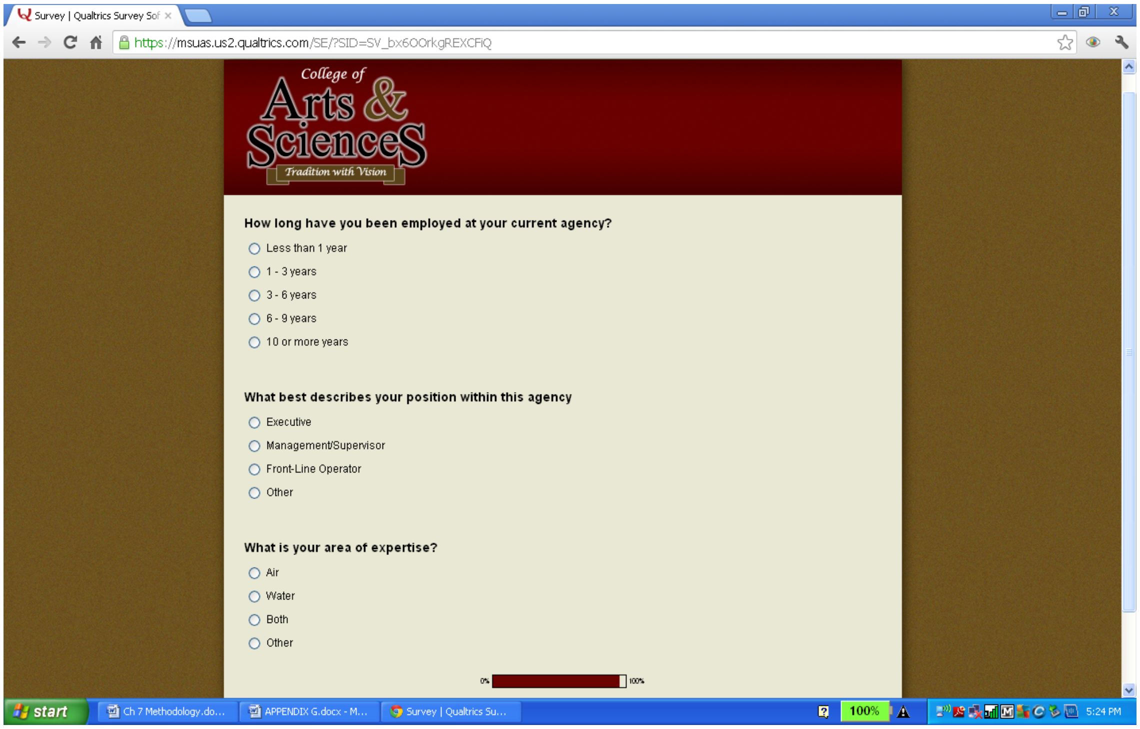

Figure G.11

Employment History Survey Questions