

The Integration of Cumulative Environmental Impact Assessments and State Environmental Review Frameworks

by

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ABSTRACT

Cumulative impact assessment (CIA) is the process of assessing a proposed action's cumulative environmental effects in the context of other past, present, and future actions, regardless of who undertakes such other actions (CEQ, 1978). The National Environmental Policy Act (NEPA) is generally acknowledged as the first legislative impetus behind CIA. It established a framework under which federal agencies are required to consider project-specific and cumulative environmental impacts of proposed projects prior to their undertaking. NEPA applies to federal actions, but many projects occur as a result of non-federal actions and are subject to formal environmental review administered by state governments. In contrast to the rich literature on federal efforts, little is known about state environmental review and CIA policies and practices.

Through a review of state environmental laws, rules and agency-prepared materials, this report identifies 37 states with formal environmental review processes. It further describes the landscape of state efforts, and establishes and applies a two-tier framework to characterize state policies and procedures. A national mail survey of state environmental review program administrators was then conducted. Twenty-nine programs across the country were identified with CIA requirements. More than half of these programs have adopted various documentations, scales, baselines, criteria, methods, and coordination practices for assessing cumulative impacts. The findings further suggest that a program with comprehensive and consistent environmental review policies and procedures does not necessarily imply extensive CIA requirements and practices.

In addition, this report discusses the barriers to and opportunities for effective CIA. Program administrators across the country are facing similar challenges regarding the inability of existing state environmental review frameworks to favorably structure CIA implementation and the technical difficulties associated with conducting CIA. Ideas were proposed for overcoming CIA barriers, including developing explicit procedural guidelines and increasing collaboration among government agencies. However, regardless the nature and characteristics of their programs, the administrators generally feel unsuccessful improving CIA practices.

Finally, this report discusses the policy implications for assessing cumulative impacts within the context of state environmental review. It also suggests that future research is needed for exploring alternative frameworks under which cumulative impacts may be more effectively analyzed.

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CHAPTER 1 INTRODUCTION

An Important Environmental Challenge: Understanding Cumulative Environmental Impacts

Cumulative impact is defined as the incremental environmental impact of a single activity assessed within the context of other past, present, and foreseeable future activities regardless of which agency or person undertakes such other activities (CEQ, 1978). Cumulative impacts can be additive or non-additive (Cocklin et al., 1992a). Additive cumulative impacts are the impacts of incremental small additions along a linear cause-effect response relationship (Contant and Wiggins, 1991). That is, as the number of projects increases, the cumulative impacts are equal to the sum of the incremental impacts of each project (Canter and Kamath, 1995). An example is the use of groundwater. Agricultural irrigation, domestic consumption, and industrial cooling facilities all contribute to drawing down a groundwater aquifer, with the cumulative impacts of these activities on the availability of groundwater being additive (CEQ, 1997). Depending on the nature of the disturbance to the environment, the cumulative impacts of a number of human actions can also be non-additive (Cocklin et al., 1992a). One example is discharges of nutrients and heated water to a river that, when combined, cause an algal bloom and subsequent loss of dissolved oxygen at a greater level than the additive effects of each discharge (CEQ, 1997).

The practice of CIA is recognized by environmental practitioners as an essential tool to facilitate sound environmental planning and management (CEQ, 1997). In a forestry context, paper mill operations and other secondary manufactures may draw wood fiber from many small logging operations located in geographically dispersed areas. Although an individual operation may impose relatively benign environmental consequences, the cumulative impacts of logging operations over time and across a state can be substantial (Kilgore and Ek, 2007). Thus, it is important to analyze, evaluate, and mitigate such cumulative impacts prior to undertaking proposed forestry projects. Failure to taking cumulative effects into account could result in damage to the forest and associated resources on a range of scales from local through state to national and even global (Roots, 1986). In summary, incorporating CIA into environmental planning and management is crucial for promoting sustainable use of natural resources and economic development that meets the needs of the present without compromising the ability of future generations to meet their needs (CEQ, 1997).

Environmental Review in the United States

The practice of CIA generally falls under the scope of an environmental review process, which includes a systematic assessment of how human actions affect the environment. Prior to 1970, few government agencies considered environmental ramifications, and environmental matters were not part of the formal decision making process in the US (South, 1986). However, with an increasingly affluent and well-educated society placing new emphasis on the quality of life, concern for environmental protection grew rapidly and was evident across the population leading to a broadly based public demand for more vigorous and comprehensive government actions to prevent environmental degradation. As a result, new environmental laws were enacted quickly

and implemented throughout the 1970s (Kraft and Vig, 2006). One of such laws is the National Environmental Policy Act (NEPA), passed in 1969.

NEPA was the cornerstone of a new era of environmental protection in the US. NEPA is the first national statute to mandate an assessment of the environmental impacts of major federal projects and legislative proposals significantly affecting environmental quality (Caldwell, 1998a). NEPA requires that any federal agency responsible for a proposed project prepares a formal environmental review document prior to its undertaking, following certain procedures established by NEPA and related regulations (Wood, 2003). The environmental review document has to include the following provisions: the environmental impacts of the proposed activity; any adverse effects which could not be avoided should the activity be undertaken; alternatives to the proposed activity; the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity; and any irreversible and irretrievable commitments of resources which would be involved in the proposed activity should it be undertaken (Caldwell, 1998b). The initial response of federal agencies to NEPA requirements was indifference, but experience with NEPA-related lawsuits and resultant project delays convinced federal agencies to take environmental review seriously (South, 1986).

NEPA governs federal projects, programs and plans, but has limited ability to direct environmental review of non-federal actions, which are regulated by state environmental review laws and rules. In a benchmarking study conducted by Caldwell (1998b), 28 states in the US were identified as having formal environmental review procedures. Great variations exist among these states. Some have adopted policies that mimic in scope and intensity of NEPA requiring the preparation of an environmental review document for each proposed development project. For example, in Minnesota an environmental assessment worksheet (EAW) or environmental impact statement (EIS) is required for projects undertaken, permitted, or funded by state agencies and local government units, as long as the projects are not exempt by state laws or administrative rules. Some states' environmental review requirements are specific to different types of economic development projects and only applicable under certain circumstances. These states generally require the preparation of an environmental review document to be included as part of an application for state permits or funds. For instance, in Michigan a special-use permit is required for proposed housing, commercial, or industrial development located in critical sand dune areas. In order to obtain such a permit, an environmental evaluation is mandated as part of the special-use permit application.

A number of studies have been conducted to evaluate the effectiveness of existing environmental review procedures. At the federal level, Canter and Clark (1997) posit that NEPA is accomplishing its fundamental goal – requiring federal agencies to include environmental considerations in project planning and decision making along with the more traditional engineering (or technical) and economic analyses and evaluations. NEPA has provided a practical framework for encouraging federal agencies to: (1) acknowledge the potential environmental consequences to the public, thus open up the decision making process related to specific projects and policies; and (2) think about environmental consequences and relevant mitigation measures before resources are committed and irreparable environmental damage occurs (Canter and Clark, 1997). While NEPA is meeting its fundamental goal, some researchers have identified aspects of NEPA that have not received adequate attention. Burris and Canter

(1997b) suggest that NEPA procedures give insufficient attention to environmental issues beyond a specific proposed project and across political boundaries. Canter and Clark (1997) suggest that one of the most important needs of NEPA is to develop methodological approaches for addressing cumulative environmental impacts and reducing the institutional barriers to CIA. In brief, NEPA provides a great opportunity for assessing site-specific environmental impacts of federal activities on a project-by-project basis; however, insufficient attention has been given to analyze and evaluate a proposed project's incremental contribution to the cumulative impacts within the context of NEPA reviews (McCold and Saulsbury, 1996).

In contrast to the rich literature on NEPA procedures and practices, current understanding of state environmental review efforts is narrow in scope and largely incomplete. The existing literature focuses primarily on the 15 states that initially adopted state environmental policy acts (SEPAs) modeled after NEPA. As early as 1973, Yost (1973) conducted a study comparing SEPA programs with respect to public involvement process employed, environmental impact considerations, and how states consult and coordinate with experts in the field in preparing environmental review documents. Robinson (1982) later compared New York's SEPA with those adopted by Massachusetts, California, and Washington regarding the political cultures that informed the adoption of SEPA and the procedural details of SEPA. In a similar study, the Minnesota Center for Environmental Advocacy (MCEA) (1993) compared the original 15 states' SEPAs with respect to their legal requirements and administrative procedures for conducting environmental review, and investigated the extent to which SEPAs were used to reduce toxic use or would lend themselves to this application. Other available state environmental review studies also tend to focus on SEPA states. Generally speaking, these studies examine different SEPAs, compare them with each other, or compare them with their federal counterpart.

Interestingly, not all SEPA states have received the same attention, and the volume of critical work related to the various SEPAs is not uniform among states (Sullivan, 2004). California, New York and Washington generally have the greatest amount of written work reported, while the remaining states are either briefly examined or have not received any attention at all (Sullivan, 2004). This may be due to the fact that SEPAs have been implemented to different degrees across the country. For example, in states like California, New York and Washington where SEPAs have been extensively implemented, rich information exists to examine and compare effectiveness. In contrast, little has been done to implement SEPA policies and regulations in Georgia and Indiana making it difficult to examine environmental review activities in those states.

With respect to states that have taken non-SEPA measures to require the assessment of environmental impacts, only a handful of studies have been conducted to examine relevant policies and practices. Aforementioned benchmarking study by Caldwell (1998b) in which 28 states were identified with formal environmental review procedures, briefly mentioned that among these 28 states, 13 did not adopt SEPAs but made other arrangements for requiring environmental review of proposed development projects. However, Caldwell's study failed to provide further discussion about the legal requirements and administrative procedures in these non-SEPA states. In another study, Cowart (1986) explicitly described Vermont's environmental review and permitting program. Vermont's program is different from SEPA programs because it does not require the preparation of a NEPA-like environmental review document, but rather

requiring environmental review considerations to be taken into account as part of a statewide permit application and review process. As pointed out by Cowart (1986), Vermont has done a good job of predicting and mitigating the potential environmental impacts of individual projects; however, it has not been able to protect its people from the cumulative environmental impacts of multiple projects, especially in areas of rapid growth.

In summary, it is widely believed that existing environmental review procedures are an effective tool for examining the potential environmental impacts of proposed development activities (Beattie, 1995). However, two major issues remain unclear. First, despite the rich literature on federal environmental review, current knowledge of state policies and procedures has a narrow focus on a few SEPA states and demonstrates an incomplete understanding of the landscape of state environmental review processes. Second, the literature suggests that existing environmental review procedures, particularly at the federal level, have been generally effective in evaluating project-specific environmental impacts, while the assessment of cumulative impacts is lacking. However, the extent to which environmental review procedures at the state level address the issue of cumulative impacts remains unclear in most cases.

Assessment of Cumulative Impacts within the Context of Environmental Review

Considerable effort has been made at the federal level to incorporate CIA into the NEPA process. Subsequent amendments to NEPA and related judicial interpretations have attempted to provide legal support for integrating CIA and project-specific environmental review (Spaling and Smit, 1993). The 1978 regulations promulgated by the Council on Environmental Quality (CEQ) defined cumulative impact and provided a conceptual framework for assessing it (CEQ, 1978). Reports and guidelines have also been published to facilitate federal practices. In 1997, the CEQ published a handbook titled *Considering Cumulative Effects under the National Environmental Policy Act* to discuss general procedures for assessing cumulative impacts in a NEPA document (CEQ, 1997). In 1999, the Environmental Protection Agency (EPA) conducted a study titled *Consideration of Cumulative Impacts in EPA Review of NEPA Documents* to assist NEPA document reviewers in providing accurate, realistic, and consistent comments on the assessment of cumulative impacts (EPA, 1999). In 2002, the National Cooperative Highway Research Program (NCHRP) published a reference book titled *Desk Reference for Estimating the Indirect Effects of Proposed Transportation Projects* to identify various types of indirect and cumulative effects and establish an analytical framework for federal agencies to estimate the effects of proposed transportation projects (NCHRP, 2002).

Despite the federal efforts to promote CIA, cumulative impacts have been only marginally assessed in the NEPA process (Canter and Kamath, 1995). McCold and Holman (1995) reviewed 89 environmental assessments (EAs) published in the Federal Register in 1992 and found that only 39% of the EAs provided evidence that cumulative impacts were considered. Burris and Canter (1997a) systematically reviewed cumulative impact considerations in environmental review documents prepared on a variety of project types under NEPA regulations. They also found that cumulative impacts were neither normally mentioned nor thoroughly analyzed in these documents.

Researchers have investigated the reasons for lack of CIA practices within the context of NEPA and suggested that insufficient CIA may be due to: (1) the technical difficulties associated with assessing cumulative impacts; and (2) the lack of institutional mechanisms and support for incorporating CIA into the NEPA process. Regarding the technical difficulties, there are three major concerns. First, it is difficult to define the time and geographic scales for assessing cumulative impacts. In terms of defining time scales, there is a general agreement that relevant past and future actions should be considered in a CIA process, but it is uncertain as to how far into the past and future to analyze cumulative impacts (McCold and Saulsbury, 1996). In terms of defining geographic scales, if a large scale is defined, only a superficial assessment may be possible and uncertainty will increase; if a small scale is defined, a more detailed examination may be feasible but an understanding of the broad context may be sacrificed (CEAA, 1994). Second, it is difficult to determine an appropriate baseline for CIA. Common practice is to consider the existing environmental condition as the baseline for an environmental review. However, this practice may not be appropriate for CIA because it makes the effects of past actions part of the baseline rather than contributors to cumulative impacts (McCold and Saulsbury, 1996). Finally, existing methodologies for CIA are not always practical, feasible, or effective (Cooper and Canter, 1997a). Cocklin and colleagues (1992b) reviewed a selection of CIA methods and identified environmental checklist and matrix as the two most commonly used methods. An environmental checklist is simply a list of environmental effects and impact indicators, which merely acknowledges a proposed project's potential for environmental impacts with little attempt made at qualitative or quantitative assessment, and thus, offers limited opportunities for predicting and evaluating cumulative impacts (Cocklin et al., 1992b). Matrix approaches are normally achieved in a matrix format where project activities are listed along the horizontal axis and effects are listed along the vertical axis. Summation over both rows and columns could give a measure of total impacts of the proposed project. However, the summation of matrix values may not be an accurate measure of non-additive cumulative impacts (Cocklin et al., 1992b).

Regarding the lack of institutional mechanisms and support, five major concerns arise. First relates to inadequate procedures for conducting CIA. Burris and Canter (1997a) suggest that insufficient CIA may be due to either the absence of specific requirements or uncertainty as to what to address. Cooper and Canter (1997b) conducted a review of 33 federal EISs and found that inadequate procedures contributed to insufficient analysis of cumulative impacts in these documents. Second, insufficient CIA may be due to a lack of collaboration among project proposers. Environmental review is often limited to individual ownerships and the analysis of environmental impacts is often limited to the site and lifespan of a proposed project (Ziemer, 1994). There is no established system that encourages collaboration among project proposers and that helps them to gather information regarding other relevant past and future projects for assessing cumulative impacts, particularly when it involves business competitors (Dubé, 2003). Another important CIA inhibitor may be a lack of coordination among federal agencies (Burris and Canter, 1997b). A CIA process requires considerable information and technical expertise, in which coordination is very important for facilitating the sharing of data and technical resources. Without coordination, an agency alone may not be able to assess cumulative impacts and therefore, may opt not to include CIA in its NEPA documents at all. Additionally, shrinking budget and increasing workload of federal agencies may also affect the practice of CIA (João, 2002). Finally, insufficient CIA may be due to minimal public awareness of CIA's value.

Because cumulative environmental changes are incremental, cumulative impacts are often disregarded until environmental and social consequences become considerable (Tollefson and Wipond, 1998).

Researchers have suggested ideas for overcoming some of the barriers. Clark (1994) suggested establishing a national environmental baseline database. This would require considerable coordination among different governmental units to collect environmental data by ecological regions, store these data based on common protocols, and share access to these data. In addition, Clark (1994) suggested that the International Association of Impact Assessment, one of the most experienced and knowledgeable environmental review organizations, could lead an effort to develop a CIA handbook containing methodological guidelines and case studies to allow practitioners to learn from one another. Cooper and Canter (1997a) suggested establishing an environmental monitoring program as part of the NEPA procedures. The environmental data collected through monitoring would become part of the baseline data for future CIA in the NEPA process.

Contrasting with the rich literature on federal CIA policies and practices, little is known about the assessment of cumulative impacts of non-federal actions. So far, three studies provided discussion about CIA at the state level. In aforementioned study describing Vermont's environmental review and permitting program, Cowart (1986) concluded that one of the program's major weaknesses was its inability to predict and minimize the cumulative environmental impacts of multiple projects (Cowart, 1986). Kamaras (1993) used NEPA as a benchmark and discussed the environmental review policies in California, New York, and Washington with respect to CIA requirements. Kamaras (1993) suggested a lack of understanding among environmental review programs about what a CIA was supposed to cover and what procedures could be followed when preparing such a document. In another study, Spaling and Smit (1993) briefly discussed that among the 28 states with formal environmental review requirements, some have adopted procedures for assessing cumulative impacts of proposed projects. However, they failed to identify which particular states have adopted CIA procedures and how these procedures have been implemented. Besides these three studies, no research has been found discussing CIA policies and practices at the state level, which suggests a great information void. This void includes a lack of understanding with respect to: state policies for considering cumulative impacts when assessing environmental impacts of proposed projects; procedural requirements for conducting CIA; scales, criteria, and methods used for assessing cumulative impacts; and barriers to and opportunities for effective integration of CIA and state environmental review framework.

Previous studies focused on environmental review and CIA at the federal level but demonstrated a lack of knowledge on state efforts, and thus set the stage for this research. This research aims at updating and completing the current understanding of state policies and procedures for environmental review and CIA, promoting best practices at the state level to facilitate sound environmental planning and management, and providing a baseline for future research. In particular, this research: (1) examines state environmental review frameworks under which cumulative impacts are analyzed and evaluated; (2) describes the landscape of state policies for incorporating CIA into these frameworks; (3) examines the practices of CIA at the state level; (4) identifies barriers to and opportunities for effective implementation of state CIA policies; and (5)

discusses the implications for improving states' abilities to predict and minimize adverse cumulative environmental impacts. Academically, this research will contribute to the body of literature on environmental planning and management by providing an updated and complete understanding of environmental review and CIA. Practically, lessons learned from this research will assist in states' efforts to strengthen existing environmental review procedures, address the growing recognition of the critical impacts illuminated by a CIA, and better balance the needs for economic development and environmental protection.

This report is organized into five chapters. This first chapter provides an introduction to the issue of cumulative environmental impact assessment. It describes the existing environmental review frameworks for assessing cumulative impacts. It also provides a review of literature on CIA policies and practices. Finally, it highlights the information void with respect to the lack of understanding of state environmental review processes, and CIA efforts within these processes.

Chapter Two addresses one aspect of the information void by describing the landscape of state environmental review policies and procedures. It establishes and applies a framework to characterize these policies and procedures, and identifies important policy and program attributes that may contribute to effective environmental review at the state level. The data used in this chapter come from a national review of state environmental review policies and procedures, and phone interviews with government staff who are involved in state environmental review processes.

Chapter Three examines in detail the CIA policies and practices in each state with formal environmental review requirements. In particular, this chapter discusses CIA policies, examines CIA practices, and explores the relationship between CIA policies and practices. The data for this chapter come from an exhaustive review of state environmental review documents with a focus on CIA, and responses to a national mail survey of state environmental review program administrators. The data are described using descriptive statistics and further examined using multiple correspondence analyses.

Chapter Four focuses on identifying the practical challenges that confront state environmental review program administrators as they attempt to incorporate CIA into their programs. It also provides a discussion of potential opportunities for improving CIA efforts within the context of state environmental review. The data for this chapter come from aforementioned national mail survey. Both descriptive statistics and logistic regression procedures are adopted for examining the data.

Chapter Five is a synthesis of this research. In particular, it reviews the importance of the CIA issue, highlights the scholarly and practical needs for this research, summarizes the findings from Chapter Two, Three, and Four, provides a discussion of policy implications, and suggests a direction for future research on the topic of environmental planning and management with respect to cumulative environmental impact assessment.

CHAPTER 2

CHARACTERIZING THE LANDSCAPE OF STATE ENVIRONMENTAL REVIEW POLICIES AND PROCEDURES: A NATIONAL ASSESSMENT

Introduction

Environmental review is an important mechanism for disclosing information about a proposed project's environmental impacts and identifying alternatives and mitigation measures by which such impacts can be minimized prior to undertaking the project. The environmental review requirement has been institutionalized in the US over the past four decades. At the federal level, the NEPA provides a comprehensive framework for federal agencies to assess environmental impacts of their proposed activities prior to their undertaking. Among state governments, many have adopted their own environmental review framework for evaluating nonfederal actions. A number of studies have been conducted to examine existing environmental review procedures and appraise their value in promoting sound environmental planning and management. As some scholars pointed out, the existing procedures are the best technique developed so far for acknowledging and dealing with the potential environmental impacts of human activities (Beattie, 1995).

Environmental review studies in the past have primarily focused on the federal NEPA. No comprehensive understanding has been developed about the policies and procedures at the state level, where economic development projects occur as a result of nonfederal actions. This paper will describe the landscape of state environmental review efforts, characterize existing frameworks under which environmental impacts are evaluated, and identify important policy attributes that may contribute to effective practices at the state level. Lessons learned from this study can assist states' efforts to continue the assessment of environmental impacts of proposed projects, strengthen their ability to inform environmental decision making, and help them better understand the potential and limitations of existing environmental review frameworks.

Environmental Review Efforts in the US

Prior to 1970, few government agencies considered environmental ramifications, and environmental matters were not part of the decision making process (South, 1986). However, with an increasingly affluent and well-educated society placing new emphasis on the quality of life, concern for environmental protection grew rapidly and was evident across the population leading to a broadly based public demand for more vigorous and comprehensive governmental actions to prevent environmental degradation. As a result, new environmental laws were enacted quickly and implemented throughout the 1970s (Kraft and Vig, 2006).

NEPA, passed in 1969, was the cornerstone of this new era of environmental protection in the US. NEPA was the first national statute to mandate an assessment of potential environmental impacts of major federal projects and legislative proposals that may significantly affect the quality of the human environment (Caldwell, 1998a). NEPA did three things: it declared a broad conceived national policy for the environment; provided procedures to force federal agencies to observe the policy; and established the CEQ to oversee both (Caldwell, 1998a). Under NEPA

legislation and CEQ regulations, any federal agency responsible for a proposed action having the potential to cause significant environmental impacts is required to prepare a formal environmental review document following established procedures (Wood, 2003). The environmental review document has to include the following provisions: the environmental impacts of the proposed activity; any adverse effects which could not be avoided should the activity be undertaken; alternatives to the proposed activity; the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity; and any irreversible and irretrievable commitments of resources which would be involved in the proposed activity should it be undertaken (Caldwell, 1998b). The initial response of federal agencies to NEPA requirements was indifference, but experience with NEPA-related lawsuits and resultant project delays convinced federal agencies to take environmental review seriously (South, 1986).

Numerous books, scientific journals, and agency reports have been published assessing NEPA and its effectiveness. Canter and Clark (1997) suggest that NEPA is accomplishing its fundamental goals—requiring federal agencies to include environmental considerations in project planning and decision making along with the more traditional engineering (or technical) and economic analyses and evaluations. NEPA has provided a practical framework for encouraging federal agencies to: (1) acknowledge proposed projects' environmental consequences to the public, thus open up the decision making process related to the projects; and (2) think about environmental consequences and relevant mitigation measures before resources are committed and irreparable environmental damage occurs (Canter and Clark, 1997). Others, however, have identified specific aspects of NEPA that are not given adequate attention. For example, McCold and Saulsbury (1996) suggest that NEPA ineffectively addresses or moderates potentially significant cumulative environmental impacts. Burriss and Canter (1997) suggest that NEPA procedures give insufficient attention to environmental issues beyond a specific proposed project and across political boundaries. They also suggest that attention be given to the development of mechanisms for post-environmental review monitoring and to increase training of federal personnel implementing NEPA.

NEPA provides a great opportunity for considering the environmental consequences of proposed federal projects and for informing environmental planning and decision making at the federal level. However, it has limited ability to direct environmental review of nonfederal actions, which are regulated by state environmental review laws and rules. If a project is undertaken under the jurisdiction of state or local governments and its potential environmental impacts are not assessed, unanticipated environmental consequences can be difficult to undo or mitigate, and environmentally sensitive areas may be irreparably damaged (MEQB, 2007). To assist in making decisions about whether to issue necessary state permits to proposed projects or grant state funds in support of a proposal, many states have adopted policies requiring environmental review for activities proposed, permitted, or funded by state agencies and/or local units of government. In a benchmarking study conducted by Caldwell (1998a), 28 states in the union were identified with formal environmental review policies and procedures. This study provided an overview of state environmental review efforts and suggested that variations exist across states. Some states adopted policies following the NEPA model, and require the preparation of an NEPA-like environmental review document for each proposed economic development project within the state. Some states adopted more limited environmental review requirements that are only

applicable to specific state agencies, specific proposed projects, or specific locations (South, 1986; Caldwell, 1998a).

Despite the important role state-level environmental review plays in facilitating environmentally-sound economic development, our understanding of relevant state policies and procedures is incomplete. The existing literature focuses primarily on examining and comparing the original 15 states that adopted state environmental policy acts (SEPAs), which were modeled after NEPA with respects to the scope of assessment, procedures for preparing environmental review documents, and mechanisms for public review (Robinson, 1982; Mandelker, 1999). As early as 1973, Yost (1973) conducted a study comparing SEPA programs for public involvement process employed, environmental impact considerations, and how states consult and coordinate with experts in the field in preparing environmental review documents. Robinson (1982) later compared New York's SEPA with those adopted by Massachusetts, California, and Washington regarding the political cultures that informed the adoption of a SEPA and their procedural details. In a similar study, the Minnesota Center for Environmental Advocacy (MCEA) (1993) compared the original 15 states' SEPAs with respect to their legal requirements and administrative procedures for preparing environmental review documents, and investigated the extent to which SEPAs were used to reduce toxic use or would lend themselves to this application. Other available state environmental review studies also tend to focus on SEPA states. Generally speaking, these studies examine different SEPAs, compare them with each other, or compare them with their federal counterpart in an effort to understand the effectiveness of SEPA in assisting environmental planning and decision making.

Individual states have also conducted studies of their SEPAs, and ways to improve the administration and practice. Read (1993) conducted a retrospective assessment of the Wisconsin's SEPA and explored directions on how the policy could be revised to address challenges experienced by professionals involved in preparing related documents. Similarly, a report was prepared by the Montana Environmental Quality Council (MEQC) in 2000 to evaluate the implementation of Montana's SEPA and explore opportunities for facilitating state agencies in making timely environmental planning and management decisions that are well informed, cost-effective, and legally defensible.

Contrasting with the body of literature on SEPAs, minimal attention has been given to the remaining states that have taken other measures to require environmental impact assessment. Only a handful of studies have been conducted to discuss environmental review policies and practices in these non-SEPA states. Aforementioned benchmarking study by Caldwell (1998), in which 28 states were identified with formal environmental review requirements, briefly mentioned that among these 28 states, 13 adopted non-SEPA procedures. However, this study failed to provide further discussion about the 13 states regarding their legal requirements and administrative procedures. In another study, Cowart (1986) examined the Vermont Environmental Conservation Act (Act 250) and a statewide permitting program established by Act 250 requiring environmental review as part of the state's permitting process. Cowart (1986) concluded that the environmental review procedures adopted in Vermont provide a practical framework under which potential environmental impacts of development activities have been well predicted and mitigated.

In summary, current knowledge of state environmental review efforts has a narrow focus on a few SEPA states. Little information has been provided about non-SEPA policies and procedures. This suggests an incomplete understanding of state environmental review frameworks. In addition, existing knowledge on state environmental review is outdated. Since Caldwell's benchmarking study in 1998, states have encountered tremendous development pressure and numerous environmental challenges, such as land conversion and urban sprawl. The landscape of environmental regulations, in particular the interpretation of environmental review requirements and crafting of agency rules and procedures may have changed dramatically.

The purpose of this study is to build on Caldwell's study as a benchmark of state environmental review frameworks, thereby developing a more comprehensive understanding of the variability that exists among states. Based on a thorough review of state statutes and administrative rules, this study describes the landscape of state policies and procedures, applies a framework to characterize these policies and procedures, and identifies important policy attributes that contribute to effective state environmental review. The findings of this study will inform states about other states' efforts, facilitate communication across states, and provide a baseline for future efforts to promote effective practices at the state level.

Study Design

Sabatier and Mazmanian's (1981) framework for policy implementation analysis was used to guide the design of this study. The framework suggests that factors affecting state environmental review policies can be divided into three broad categories. First is the tractability of the issue with respect to the policy, which refers to the explicitness of the issue—assessment of environmental impacts—addressed in state environmental review laws and rules. Second is the ability of the policy to favorably structure the implementation process, which in the current context refers to the extent to which state policies clearly define procedures for assessing environmental impacts and mechanisms for opening up the environmental review and related decision making process to the public. The third category includes various political factors, such as public opinion, business group's attitudes towards environmental review, and media attention that supports or hinders achievement of environmental review objectives.

Building upon this framework, the study investigates state environmental review policies and procedures with a focus on the first two categories. In particular, the following five attributes are examined: (1) the legal and administrative requirements and measures for undertaking environmental review, (2) the types of development activities that are subject to environmental review, (3) the types of environmental review required and the criteria for determining environmental significance, (4) procedures for public participation, and (5) the mechanism for judicial review. Political variables were not examined because the focus of this study is on policy attributes that can be improved for facilitating effective environmental review through legal and administrative efforts. Under many circumstances, political variables, such as the attitudes toward environmental review as reflected by affected public, business community, and media are strongly influenced by factors that can hardly be changed. For example, if there is a public outcry about the potential degradation of air quality caused by a proposed power plant, the media may praise the environmental review procedures as a mean to evaluate the potential hazard and inform the decision making about whether a construction permit should be issued. In a different

circumstance, the media may criticize a state's environmental review policy to be incompatible with the state's needs for economic growth because it has the potential to drive away out-of-state investment. Therefore, media attitudes toward environmental review generally depend on the circumstances and may be influenced by factors that can hardly be changed through legal or administrative efforts. Thus, such political factors are not examined for the purpose of this study.

Two sources of information were used to collect data. First, a national review of state environmental review policies and procedures was conducted. Data were obtained from the published literature regarding environmental impact assessments in the US; state environmental laws and administrative rules for identifying environmental review requirements at the state level; guidelines, handbooks, manuals and other materials published by state agencies for directing environmental review efforts; and state websites explaining environmental review procedures. A second source of data was follow-up phone interviews with government staff involved in state environmental review processes. The interviews were conducted in states with limited public records in an effort to identify additional sources of information overlooked by the review. A profile was developed for each state based on its legal and administrative framework and specific program characteristics related to environmental review procedures. These profiles were then used for comparing policies and procedures across the country.

Results

The Landscape of State Environmental Review Policies and Procedures

Currently, 37 states have adopted some form of formal policies and procedures for conducting environmental review. These states generally require the preparation of an environmental review document in which environmental impacts of proposed development projects and/or legislative proposals are predicted and evaluated against certain criteria. In addition, mitigation measures need to be considered to minimize proposed projects' potential to cause significant environmental damage.

Great variations exist among states regarding the breath of their policies. Some states require an evaluation of any applicable nonfederal activities and legislative proposals as long as they are not exempt by state laws or rules. Some have limited requirements only applicable to certain development projects (e.g., power plants, waste management operations), for certain natural resources or environmental features (e.g., forestry, mining), or in certain geographic areas (e.g., lake shore, coastal zone). Some states mandate environmental review at both state and local levels. Some have only adopted procedures for state agencies. Many states require projects proposed, permitted, or funded by government units to undergo an environmental review process. A few states only apply their requirements to projects directly undertaken by state agencies.

States are also different with respect to the depth of their environmental review procedures. Some require a systematic review of proposed projects' impacts on a range of environmental conditions. A few states require the environmental review to focus on a specific natural resource. Depending on the nature of a proposed project, some states require the use of different documentations to either briefly or thoroughly discuss the project's potential environmental impacts; others require the preparation of a general environmental analysis regardless whether

the project in question has uncertain environmental impacts or is likely to cause significant damage. In addition, states have adopted different procedural requirements for directing their environmental review efforts. Some have explicit procedures for incorporating public comments into an environmental review process, while others require public participation without specifications. Several states' policies enclose provisions for judicial review of an environmental review process, while others do not provide the public with standing to sue.

In summary, the majority of states in the country have adopted policies and procedures for assessing environmental impacts of nonfederal economic development projects and/or legislative proposals. These states vary with respect to the breath and depths of their policies. They generally have different procedural requirements for preparing an environmental review document. They have also adopted different definitions of the public and courts' roles in an environmental review process.

A Framework for Characterizing State Environmental Review Policies and Procedures

Among the 37 states with formal environmental review policies and procedures, two distinct tiers of states can be identified (Table 1). Tier-one includes 16 states that have adopted environmental review requirements for all types of projects within states' boundaries regardless of the nature of the projects proposed and the natural resources in question. These states generally mandate an environmental review through their state environmental policy act, or SEPA, which generally requires state and/or local agencies to follow three broad steps. First, an agency must determine whether or not a proposed action is subject to environmental review. If so, the agency must then determine whether or not the action will result in significant impacts or a finding of no significant impact. Lastly, if significant impacts are expected, the action is then subject to a detailed environmental review that encloses a detailed discussion about anticipated impacts, mitigation measures, and alternatives to the action (MEQC, 2000).

In contrast, Tier-two, which includes 21 states, is less formal with respect to the policy, procedural, and reporting requirements. The majority of states require an environmental analysis of proposed projects without specification of the content or format of the analysis. In addition, these states' environmental review procedures are only applicable to certain development activities (e.g., power plants, housing development), for certain types of natural resources or environmental features (e.g., forestry, critical habitats), or in certain geographic areas (e.g., designated natural reserves, defined coastal areas). For instance, in Mississippi only projects affecting coastal wetlands are subject to review. Another example is Nevada where SEPA-like procedures have been adopted but are only applicable in the Lake Tahoe region. The variability among states in this tier can be based on states' economic development interests or their environmental or natural resource conditions.

Based on this two-tier categorization of states, Table 2 provides a list of statutes and administrative rules requiring environmental review on a state-to-state basis. This following section describe the landscape of state environmental review policies and procedures with a focus on aforementioned five attributes: (1) the legal and administrative requirements and measures for undertaking environmental review, (2) the types of activities that are subject to

review, (3) the types of reviews required and the criteria for determining environmental significance, (4) procedures for public participation, and (5) mechanisms for judicial review.

Tier-one States

Legal and Administrative Requirements and Measures

Among the 16 tier-one states, 15 have adopted comprehensive SEPA through state laws and one state, New Jersey, has adopted its SEPA-like requirements but through an executive order issued by the Governor in 1989. South Dakota is a unique case among tier-one states. Its SEPA does not mandate environmental review for state agencies. Instead, it is up to the agency to decide whether to prepare an environmental review document for its action. However, once the agency decides to undertake an environmental review, it has to follow procedures provided in the SEPA.

All tier-one states have clearly defined objectives of their environmental review policy, which include: to encourage harmony between human beings and their environment, to enrich the understanding of the ecological systems, and to utilize a systematic and interdisciplinary approach in planning and decision making that may or will damage the quality of the environment (MEPA, 1973). To help achieve these policy objectives, eleven states have adopted administrative rules and one has adopted statewide guidelines serving as administrative rules. These twelve states have also published additional factsheets, manuals, or handbooks further directing responsible government units and private parties to provide necessary documentation for analyzing proposed projects' environmental impacts (Table 3).

Besides Georgia, 15 of the tier-one states have designated a single state entity with responsibility for overseeing the implementation of environmental review policies. Georgia does not have a designated responsible entity and its SEPA has not been implemented since its adoption. Common duties of the responsible entity include writing administrative rules, issuing procedural guidelines, coordinating environmental review of proposed projects involving multiple government units, and assisting state and/or local agencies in their review efforts. Generally speaking, entities with duties concerning the substance of review processes, such as writing rules and issuing guidelines, tend to play a more significant role in shaping states' environmental review efforts than entities with only advisory duties. For instance, in Minnesota the oversight entity is the Environmental Quality Board (EQB), which is part of the executive branch of the state government. The EQB has a significant role in shaping Minnesota's environmental review policies and procedures by writing rules for conducting environmental review. In addition, it also has the authority to order a discretionary environmental assessment worksheet (EAW) based on its consideration of an action's potential significant environmental impacts. In contrast, Montana's oversight entity, the Environmental Quality Council (EQC), has relatively small influence because it is a legislative committee with only advisory authority to assist state agencies in developing environmental review rules.

Projects Subject to Review

All tier-one states require environmental reviews for applicable government actions, but the definition of government action differs considerably from state to state. In eight states, relevant

actions only include state actions, while in an additional eight states, relevant actions can include both state and local actions (Table 3). The definition of a relevant state action also varies across states. For example, in California and Minnesota state actions refer to both physical projects (e.g., housing developments, highway construction) and non-physical actions (e.g., legislative proposals, adoption of regulations). Virginia defines relevant state actions as activities undertaken by a branch of state government with a costs totaling more than \$100,000. There is also variation regarding the definition of local actions. In some states like Minnesota and Washington, local actions refer to projects undertaken by or subject to the approval by a local unit of government, such as a county board or township. Other states like North Carolina define local actions as those undertaken by local units of government but that are financially supported by state agencies. In addition, ten of the sixteen tier-one states also require environmental review of private actions in which state and/or local permits are required or state and/local government funds are used.

Types of Reviews Required and Criteria for Determining Environmental Significance

Thirteen tier-one states require the preparation of an environmental assessment (EA) or an equivalent document (Table 3). An EA presents information about a project's potential environmental impacts and is generally prepared to determine whether further analysis is warranted. Among the 13 states, seven, such as Massachusetts and Minnesota, have adopted mandatory EA thresholds. If a proposed project meets the threshold, an EA is required. For the remaining six states without mandatory thresholds, a proposed project is subject to EA unless otherwise exempt by state laws or rules.

All tier-one states require the preparation of an environmental impact statement (EIS) or an equivalent document for projects that may or will significantly affect the quality of the environment. An EIS is a thorough study of a project's potential environmental impacts and often includes an evaluation of alternatives and mitigation measures. Six states have adopted mandatory EIS thresholds. For the remaining ten states without mandatory EIS thresholds, an EA is generally conducted in lieu of an EIS and if it is determined that the project has the potential for significant environmental impacts, an EIS is prepared.

In the seemingly straightforward process of identifying the likely environmental impacts associated with proposed projects, determining the significance of a proposed project's environmental impacts is not trivial. Currently, eight states have adopted specific criteria to guide their decisions about determining the significance of environmental impacts. Through the review of state laws and rules and conversations with government staff involved in state environmental review processes, this study found that most of the existing significance criteria are vague and not directly measurable. For example, one state's environmental policy act provides general terms for determining the significance of a likely environmental consequence, including the setting, probability of occurring, duration, irreversibility, controllability, geographic scope, and magnitude. However, these terms are not directly measurable, and therefore, have limited use to help project proposers and responsible government units determine the environmental significance of proposed projects and to inform EIS decisions.

Procedures for Public Participation

Public participation procedures are other key elements of state environmental review processes. They are important for acknowledging proposed projects' environmental consequences to the public, thus opening up the environmental decision making process. All first-tier states except New Jersey and Virginia require public participation when conducting environmental review (Table 3). Responsible government units typically publish public notice of the project under reviews and provide opportunity for the public to comment on draft environmental review documents. States generally request the public to submit relevant comments via mail or email. A few states, such as Minnesota and Washington, also provide opportunity for organizing public hearings in an environmental review process. A majority of tier-one states have adopted specific timeframes for public participation. For instance, in Hawaii a 30-day public review and comment period is required for a draft EA and a 45-day period is required for a draft EIS.

Mechanisms for Judicial Review

Judicial review of an environmental review process is important for providing supervision to the implementation of state environmental review laws and rules. Nine states have enclosed provisions for judicial review in their SEPA's providing opportunities for the public to formally challenge a government agency responsible for overseeing an environmental review process in a court of law (Table 3). These states allow the public to challenge an agency with respect to whether the agency followed appropriate procedures to prepare an environmental review document or conduct public reviews. Among these states, eight also provide the public with opportunities to challenge the substantive decisions of an agency. For example, in California the public may challenge an agency's decisions regarding whether a proposed project is subject to environmental review, the need for an EIS, or the adequacy of an EIS. Several states have also adopted specific timeframes for judicial review. For instance, in Hawaii a 120-day judicial appeal period is granted to challenge the lack of assessment after an agency determines that a proposed project is not subject to review and after the project is started. For an EA process, there is a 30-day period to challenge an agency's determination of a finding of no significant impact and 60-day period to challenge its determination of no need for EIS. In addition, an aggrieved party has 60 days during which they may challenge the acceptability of a final EIS.

In summary, about one-third of the states have a SEPA modeled after the federal NEPA, requiring comprehensive review of proposed projects undertaken, permitted, or funded by state agencies and/or local units of government. Despite having similar policy objectives, great variations exist among these states with respect to the level of procedural guidance provided for implementing state policies, project coverage, and the types of review documents used. In addition, SEPA states have different procedures for public participation and judicial review.

Tier-two States

Legal and Administrative Requirements and Measures

The 21 tier-two states have adopted environmental review requirements through various state statutes and/or administrative rules. These states can be differentiated from the tier-one states in

that: (1) their environmental review requirements are only applicable to certain development activities, for certain types of ecologically important natural resources or environmental features, or in certain geographic areas; and (2) they do not have a government agency responsible for overseeing and coordinating state environmental review efforts. Tier-two states may have multiple state programs that have adopted environmental review requirements, with each responsible for taking measures to implement its own requirements. Across the 21 states, 62 such environmental review programs were identified. These programs require environmental review to be conducted when there is a proposal to undertake certain state projects or when state agencies are responsible for granting relevant permits or funds. The number of state environmental review programs within each state ranges from one to seven, though having more programs in a state does not necessarily indicate there exists more effective mechanisms for assessing environmental impacts. For instance, Nevada has only one identified program requiring environmental review for proposed projects located in the Lake Tahoe region, yet the comprehensiveness of the program is comparable to the level of the most rigorous states having a SEPA. Alternatively, Illinois has seven different programs all with different levels of environmental review requirements, yet these programs generally do not provide specific guidance for conducting environmental review and there are no specifications about the content or format of required environmental review documents.

Projects Subject to Review

State involvement is the basis for proposed projects to undergo an environmental review process in all tier-two states. A project may be subject to review if a state agency is the proposer or responsible for issuing relevant permits or providing funds. Unlike tier-one states, tier-two states do not have consistent requirements for environmental review across resource areas. In fact, only certain development activities are subject to review based on a state's economic development interests or its environmental and natural resources conditions. For instance, Florida is the only coastal state requiring artificial reef construction projects to undergo an environmental review process. Another example is Michigan where environmental impact analysis is required for proposed projects located in critical sand dune areas. The only projects exhibiting some overlap among states are waste management activities, mining operations, and actions affecting wetlands, rivers, lakes and coastal areas, which are assessed in five or more states. Besides these, there are no patterns observed regarding the types of projects subject to review across tier-two states.

Types of Reviews Required and Criteria for Determining Environmental Significance

The types of reviews required by programs in tier-two states also vary. Out of the 62 programs, three have requirements similar to those adopted in tier-one states. They require different levels of review based on proposed projects' environmental impacts. These programs generally provide three options: an environmental checklist of impacts, an EA, and an EIS. If a proposed project is subject to review, the responsible state agency determines which level of review is necessary. If an environmental checklist is prepared and it indicates that the project may cause significant environmental impacts, an EA is then prepared. If an EA is still not sufficient for assessing the project's impacts, an EIS is required to provide further analysis. The other 59 programs in tier-two states do not have such a hierarchical system, but rather simply require the preparation of one document analyzing a proposed project's environmental impacts to be included as part of an

application package for permits or state funds. Among these 59 programs, some provide specific guidance on the content and format of the document required, while others do not provide any specifications. In addition, several programs have adopted review documentation that is tailored to particularly assess certain types of impacts. For instance, seven programs do not require site-specific environmental impact analysis. Instead, they require the preparation of an assessment articulating the cumulative environmental impacts of proposed activities. Another example is one program in Illinois which requires all the environmental review documents to focus on proposed projects' impacts on endangered species and their habitat.

In addition, the programs in tier-two states generally do not specify criteria for determining the significance of environmental impacts. It may be due to the fact these programs generally require the preparation of one particular environmental review document and no determination of environmental significance is needed for deciding which document to prepare. However, for the aforementioned three programs requiring different levels of review, the determination of environmental significance is a challenge. Through the review and phone interviews with program administrators and staff, this study found that these three programs have not adopted measurable significance criteria.

Procedures for Public Participation

Unlike in most tier-one states, public participation is not a prevalent requirement for conducting environmental review among tier-two states. Most programs in tier-two states mandate public participation for issuing development-related permits or granting state funds to proposed projects, but they do not have specific procedures for incorporating public comments into the assessment of environmental impacts.

Mechanisms for Judicial Review

Environmental review laws in tier-two states generally do not enclose provisions for judicial review. The public in tier-two states has limited or no standing to challenge a state agency regarding its procedural correctness of preparing an environmental document or substantive decisions about whether to conduct an environmental review or whether a prepared document is adequate. However, the public is often provided with opportunities to challenge an agency's procedural correctness of issuing or denying state permits, which is often informed by the environmental review document prepared for a proposed project.

Overall, nearly half of the states in the US have adopted divergent environmental review requirements that are implemented by 62 different state programs. These requirements are different from SEPA requirements and are only applicable to specific development activities under certain circumstances. The diversity of state policies and procedures reflects each state's desire to: (1) balance the need for economic development and for environmental protection, (2) prioritize the types of economic development activities in need for environmental planning, and (3) adopt relevant measures to mandate environmental review for those activities. In addition, the comparison of state policies and procedures identifies natural resources in certain states that are not under the purview of environmental review regulations making them susceptible to environmental degradation. The comparison also suggests that tier-two states generally do not

provide opportunities for public participation nor judicial review of an environmental review process.

Discussion and Conclusion

Environmental review processes in the US have provided a great opportunity for encouraging government agencies and private parties to take into account environmental factors when planning for future development (Beattie, 1995). At both federal and state levels, laws and rules have been adopted to require environmental review for applicable development activities and legislative proposals prior to their undertaking. Numerous books, scientific journals, and agency reports have been published examining and evaluating environmental review efforts across the country. However, the existing literature focuses primarily on NEPA and NEPA-like SEPA, suggesting an incomplete understanding of state environmental review policies and procedures, particularly in states that have taken non-SEPA measures to require environmental review of proposed nonfederal actions (Yost, 1973; Robinson, 1982; South 1986; MCEA, 1993; Burris and Canter, 1997a; Canter and Clark, 1997; Caldwell, 1998a; Caldwell 1998b; Mandelker, 1999; Wood, 2003).

This study contributes to the literature by updating current understanding and providing a complete description of the landscape of state environmental review frameworks. Thirty-seven states were identified in this study with some form of formal environmental review policies and procedures. Based on the breadth and depth of the policies and procedures, a two-tier categorization was suggested for characterizing state efforts. Tier-one includes 16 states with comprehensive and consistent requirements mandating environmental reviews for applicable state and local projects. Tier-two includes 21 states having environmental review requirements that are only applicable to certain development activities, for certain ecologically-important natural resources or environmental features, or in certain geographic areas.

Do states in one tier have more effective measures for promoting environmental review efforts than states in another tier? This study shows that tier-one states generally have policies and procedures comparable to those of the federal NEPA regarding the policy objectives, legal and administrative requirements, the types of projects subject to review, the types of reviews required, and public participation and judicial review procedures. In addition, these states' environmental review requirements are consistent statewide across natural resource sectors regardless of the types of development projects in question. In contrast, tier-two states are generally less inclusive in their relevant thresholds for triggering mandatory environmental review, their procedures for preparing review documents, as well as the mechanisms for public participation and judicial review. In addition, these states' environmental review requirements differ according to specific circumstances and the comprehensiveness of the requirements greatly depends on individual state agencies and the types of projects in question. This is a general trend, however great variations were also observed among states in each of the two tiers. A tier-two state with multiple programs mandating environmental reviews for a wide range of development activities may be, in fact, more effective in its effort to predict and minimize environmental degradation than a tier-one state that only requires environmental review for less common projects. Therefore, although the two-tier categorization is useful for characterizing state environmental

review policies and procedures, it is not appropriate to determine the effectiveness of state policies and procedures solely based on the tier to which a state belongs.

Independent from whether a state is a tier-one or tier-two state, this study suggests that the following policy and program attributes may contribute to the effectiveness of state environmental review efforts:

Clearly defined policy objectives contribute to effective implementation of state policy. The forementioned policy implementation framework (Sabatier and Mazmanian, 1981) suggests the explicitness of the environmental review issue addressed in state laws and rules contributes to effective implementation of state environmental review procedures. To explicitly address the issue, clear defined policy objectives are needed with respect to assessing proposed projects' environmental impacts prior to their undertaking, and to providing adequate information to inform environmental decision making. If a policy has ambiguous objectives, state and local agencies will feel little obligation to implement the policy.

Practical guidance interpreting the statutory requirements for environmental review contributes to effective practices. The policy implementation framework also suggests that the effectiveness of a policy is affected by the policy's ability to favorably structure its implementation (Sabatier and Mazmanian, 1981). State environmental review statutes are generally written in vague language providing general requirements for assessing environmental impacts without specifications. Practical guidance provided by administrative rules and agency-prepared factsheets, manuals and handbooks can help interpret environmental review statutes and assist all parties in preparing necessary documents. Thus, it contributes to strengthening the ability of a state environmental review policy to favorably structure its implementation, and eventually lead to effective practices.

Procedures for public participation are important for facilitating sound environmental planning and decision making. Having explicit procedures for public participation is also an important attribute of state environmental review policy. These procedures enable the public to comment on environmental review documents prepared for proposed projects, thus participate in the planning and decision making process. They also contribute to ensuring environmental review procedures are consistently applied by government agencies responsible for implementing relevant state policies.

Judicial reviews provide supervision to an environmental review process. Supposedly, judges are neutral and uninterested in the outcome of an environmental review process regarding the issuance or denial of requested permits or funds. Therefore, obtaining judicial review of the procedure correctness or substantive reasonableness of agency decisions provides the advantage of objectivity (MCEA, 1993). In addition, provisions for judicial review allow courts to interpret generally ambiguous statutory requirements and provide guidance for conducting environmental review in practice.

Other policy and program attributes may also affect state environmental review efforts. For example, adequate staffing and sufficient resources may play an important role in assuring

effective implementation of state review procedures. Due to limited data, this study did not examine these attributes.

Finally, this study identified 13 states in the US without formal environmental review requirements. Although a few states ask their agencies to consider environmental factors when issuing state permits, no specifications have been provided about what and how environmental factors should be evaluated. For these 13 states, the adoption of SEPA may not be an option because it requires dramatic reform of a state's environmental decision making process, and may involve multiple government units and affect businesses and industries statewide. However, the tier-two approach may be more appealing because it facilitates incremental change by promoting environmental review procedures tailored toward individual state agencies' needs and conditions. Regardless of which approach a state takes, it is important that efforts are made to facilitate the adoption of clear policy objectives, practice guidelines, explicit public participation procedures, and appropriate judicial review mechanisms in order to maximize the potential effectiveness of a state environmental review policy.

CHAPTER 3

ASSESSING CUMULATIVE IMPACTS WITHIN STATE ENVIRONMENTAL REVIEW FRAMEWORKS

Introduction

Cumulative environmental impacts are the incremental effects of a single action assessed in the context of other past, present, and future actions, regardless of who undertakes such actions (CEQ, 1978). CIA is the process of systematically analyzing and evaluating these cumulative environmental effects. CIA is an important component of a formal environmental review process, in which potential environmental impacts of proposed development activities are examined. When a proposed development activity is evaluated, a key issue is to determine the significance of its potential environmental consequences. Most formal environmental review processes require the proposer to assess and determine the significance of predicted environmental impacts on a project-by-project basis. However, this ignores important cumulative environmental impacts that may occur when the proposed development is considered in the context of existing and/or other proposed activities similar in nature. When viewed individually, the environmental impacts of the proposed development may appear inconsequential; yet the environmental impacts of similar and related development activities may be significant when viewed over an extended period of time and/or across a large landscape (Cocklin et al., 1992; EPA, 1999). If a project proposer fails to adequately assess cumulative impacts within an environmental review process, potentially significant impacts could be overlooked, even though such impacts may be key in determining the need for further environmental study, or whether relevant permits or funds should be granted (Canter and Canty 1993; Burris and Canter, 1997a; Hegmann et al., 1999). Consequently, if cumulative impacts are not properly taken into account by an environmental review process, the usefulness and credibility of the whole process may be placed in doubt (Roots, 1986; Rees, 1995).

The NEPA of 1969 is generally acknowledged as the first legislative impetus behind CIA. It established a federal environmental review framework by which federal agencies are required to analyze and minimize environmental impacts, including cumulative impacts of proposed federal projects prior to their undertaking (Spaling and Smit, 1993). The CEQ was the first entity to formally define cumulative environmental impacts (CEQ, 1978). In its 1997 handbook titled *Considering Cumulative Effects under the National Environmental Policy Act*, the CEQ provides guidance on how environmental planners can incorporate CIA as part of the federal environmental review process (CEQ, 1997). With the increasing recognition of the importance of CIA, a number of studies have examined NEPA-related requirements and strategies to improve CIA efforts under the NEPA framework. The focus of these studies has been documenting insufficient measurement of cumulative impacts in NEPA documents, and identifying possible causes for lack of practices (Herson and Bogdan, 1991; McCold, 1991; Clark, 1994; McCold and Saulsbury, 1996; Burris and Canter, 1997b; Cooper and Canter, 1997b; Eccleston, 2001).

NEPA regulations apply to projects proposed, permitted, or funded by federal agencies, but many projects occur as a result of nonfederal actions, and therefore their cumulative environmental impacts are subject to assessments that are conducted through formal

environmental review process administered by state governments. In contrast to the many studies focusing on federal CIA efforts, little is known about the policies and practices of CIA within the context of state environmental review programs. The information void includes a lack of understanding with respect to: state requirements for considering cumulative impacts when assessing environmental impacts of proposed projects; procedural requirements for conducting CIAs; scales, criteria, and methods used to assess cumulative impacts; and potential for more effectively integrating CIA into state environmental review process.

Using the existing literature on federal CIA requirements and processes as a backdrop, this paper examines state-level CIA policies and practices within the context of environmental review. Specifically, its objectives are to: (1) identify the legal and administrative framework for state CIA, (2) examine state CIA practices, (3) discuss the relationship between CIA policy and its implementation, and (4) identify opportunities for improving the quality of CIA efforts.

Data Collection and Analysis

The data for this study come from two sources: an exhaustive review of state environmental review documents, and responses to a national mail survey of state environmental review program administrators. State environmental review statutes and administrative rules, as well as agency-prepared materials on environmental review procedures and methods were the primary documents reviewed. Agency-prepared materials included program directives, guidelines, handbooks, manuals, factsheets, and online documents gathered through web searches and conversations with program administrators. The purpose of the review was to gain a preliminary understanding of CIA policies within the context of environmental review for each state in the union. Following the review, a survey was conducted to clarify information about CIA requirements and collect information about measuring cumulative impacts at the state level.

The design of the national survey of state environmental review program administrators was guided by previous studies focusing on federal CIA. In addition to discussing general CIA requirements, these studies suggested several procedures that may contribute to the effectiveness of CIA practices. They include: (1) adopting a clear definition to help project proposers and responsible state agencies understand the concept of cumulative impacts before actually assessing it; (2) using appropriate geographic and time scales for predicting cumulative impacts; (3) developing adequate baselines for the affected resources and environmental conditions to determine the magnitude of cumulative impacts; and (4) defining criteria for determining the severity of predicted cumulative impacts and, in many states, for developing measures to mitigate unwanted consequences. In addition, a CIA process may require considerable information and technical expertise. State agencies often focus on specific environmental issues and may not have access to data or technical expertise to fully assess cumulative impacts beyond their specialized areas. As such, coordination is necessary for the sharing of data and obtaining technical support among government units. Guided by the literature, the questionnaire focused on: (1) general state requirements for assessing cumulative impacts; (2) types of natural resource issues addressed within a CIA context; (3) requirements and practices for using specific scales, baselines and criteria; (4) methods for data collection and analysis; and (5) procedures and the extent of coordination among local, state and federal government units.

The survey was conducted in 2007 using a mail-back questionnaire. A total of 37 states with formal environmental review policies were identified. These 37 states were categorized into two tiers according to the breadth and depth of their policies. Table 1 provides the categorization of each state. Tier-one includes 16 states that have adopted statewide comprehensive environmental review procedures for development activities across natural resource sectors. Tier-two includes 21 states where environmental review is required for certain activities involving environmental and natural resource management and/or in specific geographic areas. The questionnaire sent to the administrators from the two tiers of states is slightly different. For administrators from tier-one states, only CIA related questions were asked, while for administrators from tier-two states, a set of questions on general environmental review procedures and practices was also added to the questionnaire¹.

Among the 16 tier-one states, 15 active environmental review programs were identified, of which 14 administrators completed the questionnaire (93% response rate). Georgia was removed from the survey list because it does not actively conduct environmental review. Among the 21 tier-two states, 35 active programs were identified, of which 24 administrators completed the questionnaire (69% response rate). In total, in-depth information about program CIA requirements and practices was obtained from 38 out of 50 active state environmental review programs. Responses to the questionnaire was coded and digitized to enable data analysis. A profile was developed for each state environmental review program, and these profiles form the basis for discussing CIA efforts at the state level.

No formal test for non-response bias was performed. However, it is reasonable to believe that the difference between respondent and nonrespondent programs is minimal due to the facts that: (1) nationwide, 76% of the programs responded to the survey, which is a reasonably good response rate; and (2) through the review of state environmental review documents, no clear difference was observed between respondent and nonrespondent programs with respect to their levels of requirements for assessing both project-specific and cumulative environmental impacts of proposed projects. It is possible, however, that nonresponse bias exists in the data. The fact that the response rate is lower among programs in tier-two states (69%) than among programs in tier-one states (93%) makes one wonder if programs in tier-two states were less inclined to respond to the survey for reasons that could lead to nonresponse bias. As a result, caution should be used in extrapolating the results, particular to the programs in tier-two states.

In order to further explore the associations among CIA requirements and practices, a multiple correspondence analysis (MCA) was performed. MCA allows the analysis of the associations among categorical variables in a multiway contingency table (Valentin et al., 2003). MCA defines a measure of distance between any two category values of the variables, and determines which category values are associated based on the interpretation of the distance. The output is visualized on a correspondence map, which plots points (category values) along the computed factor axes in one- or two-dimensional space. The interpretation of the correspondence map is

¹ A copy of the questionnaire and cover letter used in tier-one states can be found respectively in Appendices A and B. A copy of the questionnaire and cover letter used in tier-two states can be found respectively in Appendices C and D.

based on points found in approximately the same direction from the origin and in approximately the same region of space.

MCA suits the purpose of this study because the data obtained from the review and survey is categorical (binary in most cases) and the nature of the study is exploratory—this study does not assume an underlying distribution or attempt to test a particular model but rather explore the relationship between CIA policies and its implementation. MCA has two particular limitations: (1) conclusions about the data may not be generalized at the population level (Panagiotakos and Pitsavos, 2004); and (2) MCA does not support significance testing (StatSoft, n.d.). These two limitations are not a concern of this study because first, 76% of state environmental review programs responded to nationwide, which is sufficient representation for gaining a general understanding of state trends; second, this study is focused on describing the landscape of CIA efforts and exploring the relationship between CIA requirements and practices, which does not necessitate significance testing.

Three specific analyses were preformed. First, MCA was used to examine associations among variables describing specific attributes of CIA policy. These attributes include the adoption of a cumulative impact definition, requirements for using specific scales and baselines, adoption of formal significance criteria, and requirement for intergovernmental coordination. Examining the patterns in the data allows one to identify whether programs with one procedural requirement also tend to adopt other procedural requirements. For example, if the analysis shows that the adoption of a requirement for using geographic scales is associated with the adoption of a requirement for using time scales, programs with the former characteristic will also tend to have the latter characteristic. Second, MCA was used to study associations among variables describing specific attributes of CIA practices including the use of geographic scales, consideration of relevant past projects and future actions, adoption of current or future condition as baseline, data gathering and analytic methods, and the levels of coordination among government units. Examining patterns in the data allows one to identify whether programs that implemented a particular procedure also tend to implement other procedures. Finally, MCA was used to examine the relationship between CIA policy and practice. It is commonly assumed that a procedural requirement necessarily results in the practice of that procedure. This analysis helps determine the degree to which program requirements are in fact associated with practices. All variables used in the analysis were coded as binary responses (yes or no), with four exceptions. The variable describing data gathering and analytic methods were classified as entirely quantitative, mostly quantitative, mostly qualitative, or entirely qualitative. Additionally, the three variables measuring levels of coordination among government units were classified as having extensive occurrence, moderate occurrence, minimal occurrence, or no occurrence).

Results

The Landscape of State CIA Requirements

Among 38 state environmental review programs whose administrators participated in the study, 29 programs, including all 14 from tier-one states and 15 of the 24 from tier-two states, are required by statute or administrative rule to assess cumulative impacts. Regarding specific procedural requirements, Table 4 summarizes the following attributes: (1) adoption of a

cumulative impact definition; (2) requirements for using specific scales, baselines and criteria for assessing cumulative impacts; and (3) requirement for intergovernmental coordination in a CIA process.

Because tier-one states generally have comprehensive and consistent environmental review procedures and tier-two states' requirements are only applicable to certain development activities (e.g., land development, mining) and/or in certain geographic areas (e.g., coastal zone, lake shore), one would expect to see more specific CIA requirements among programs in tier-one states than in tier-two states. However, the survey results show a different picture. For example, the percentage of programs with a definition of cumulative impacts is lower among programs in tier-one states (43%) than in tier-two states (53%). About half of the programs in tier-one states mandate the use of specific scales and baselines for assessing cumulative impacts, while about two-thirds of the programs in tier-two states have similar requirements. Forty-three percent of programs in tier-one states have formal criteria for determining the significance of predicted cumulative impacts, while 53% of programs in tier-two states have formal criteria. In addition, the percentage of programs requiring intergovernmental coordination in a CIA process is also slightly lower in tier-one states (57%) than in tier-two states (67%).

Two observations are made about programs with specific procedural requirements. First, the definition of cumulative impacts is either the same or closely resembles the one provided in NEPA for programs in both tiers. This shows that state CIA policies are influenced by the NEPA framework. Because NEPA is acknowledged as the first national law that established comprehensive environmental review procedures, as well as the first policy framework that explicitly incorporated CIA, it is not surprising that its definition of cumulative impacts is used by several state programs. It is also worth noticing that most programs adopted their definition through state laws and administrative rules, but in a few tier-one states cumulative impacts are defined through case law.

The second observation is that although some programs require the use of specific scales, baselines and criteria, these requirements are generally vague and provide little direction to project proposers or responsible government agencies in assessing cumulative impacts. For example, some programs in tier-one and tier-two states are required to assess cumulative impacts beyond a proposed project's boundary. However, specifications about how to identify an appropriate geographic scale are lacking. Some programs mandate the consideration of relevant past and future actions that may cumulatively affect environmental quality. Yet, there are no requirements regarding how far back or into the future cumulative impacts should be analyzed. Similarly, most states' requirements for using appropriate baselines do not specify the meaning of "appropriate." Consequently, it is difficult for project proposers and responsible government agencies to adopt baseline condition for a particular project. In addition, the majority of state programs are required to coordinate with other government agencies in a CIA process. However, little guidance is given for which agencies should be involved or for specific aspects of CIA in which coordination should occur.

In summary, the majority of state programs included in the study have adopted general policies requiring the assessment of cumulative impacts within the context of an environmental review process. Surprisingly, programs in tier-two states have adopted more specific procedural

requirements for directing their CIA efforts than programs in tier-one states. A common challenge facing programs in both tier-one and tier-two states is that their specific procedural requirements are still too general to be helpful to facilitate the assessment of cumulative impacts. This suggests more guidance is needed to specify procedural requirements and to help project proposers and responsible government agencies choose the appropriate scales, baselines, criteria, and coordination measures in a CIA process.

Current Status of State CIA Practices

Twenty-nine of the 38 programs whose administrators responded to the survey are required to assess cumulative impacts in their environmental review process, but it is up to each program to decide how to incorporate CIA into their existing procedures. This section discusses how these 29 programs implement CIA policies with respect to the following five areas: (1) environmental review documents used for assessing cumulative impacts; (2) types of natural resource issues addressed within a CIA context; (3) geographic scales, time scales, baselines and significance criteria used; (4) data gathering and analytic methods employed; and (5) practices of coordination among government units.

Environmental Review Documents for Addressing Cumulative Impacts

Among programs in tier-one states, two types of environmental review documents are often used for assessing cumulative impacts. For a proposed project with uncertain environmental impacts, an EA or an equivalent is prepared to discuss basic information about and impacts associated with the project. These EA documents are also used for evaluating the potential cumulative impacts of the project. For projects that are likely to significantly affect environmental quality, an EIS or an equivalent is prepared to thoroughly examine the potential environmental impacts. These EIS documents also assess cumulative impacts in the context of other past, present and future activities. In addition to standard EAs and EISs, which are comparable to those prepared in the NEPA process, some programs use alternative forms of documentation for analyzing cumulative impacts. For instance, a generic EA or EIS may be used to assess cumulative impacts of actions likely to be repeated on a recurring basis or actions having relevant similarities. One such example is in New York where a generic EIS is prepared for assessing cumulative impacts of a number of separate actions in a given geographic area which, if considered singly, may have minor impacts, but if considered together may have significant impacts on the environment. A programmatic EA or EIS is another type of documentations used in states, such as Massachusetts and Montana, to assess the cumulative impacts of a series of actions that can be characterized as one large project. For example, residential development is often followed by commercial development in the same vicinity; therefore, conducting a programmatic EA or EIS will allow one to evaluate the cumulative impacts of proposed residential development and potential commercial development as a whole. In brief, programs in tier-one states have adopted these alternative forms of environmental review to facilitate their ability to look beyond a specific proposed project and assess the project's cumulative impacts while considering other relevant past, present and future related actions.

Unlike programs in tier-one states, programs in tier-two states do not assess cumulative impacts using standard EAs or EISs, nor alternative forms of documentation as those adopted by

programs in tier-one states. In fact, these programs do not follow the NEPA precedents by providing in the preparation of NEPA-like EAs or EISs for assessing proposed projects' potential environmental impacts. Rather, they require the preparation of a general environmental analysis to be included as part of an application for state permits or funds. This document is used for assessing both project-specific and cumulative environmental impacts of proposed projects. For example, in Pennsylvania in order to apply for a permit for a proposed waste disposal project, an environmental evaluation is required as part of the permit application. This evaluation is also used to assess the cumulative impacts of the proposed project.

Natural Resource Issues Addressed within a CIA Context

Administrators were asked to identify the types of natural resource issues for which cumulative environmental impacts were assessed by their programs over the past 10 years. The survey results are summarized in Table 5. Each of the natural resource issues listed was evaluated within a CIA context by more than 70% of programs in tier-one states. The issues assessed by programs in tier-two states, however, vary from program to program, suggesting that programs in tier-two states tend to be selective regarding what issues to evaluate. The results also show that issues related to air quality, mineral mining, and nonmetallic mining were assessed by the majority of programs in tier-one states, but only a few programs in tier-two states. Additionally, administrators were asked to identify how often each type of issues was assessed. A majority reported that the issues listed were assessed in less than 50% of their environmental review documents over the past 10 years. These results indicate that many state programs have conducted CIA over a wide range of natural resource issues. However, few programs have assessed a particular issue for CIA on a frequent basis.

Administrators also rated the difficulties in assessing cumulative environmental impacts by different natural resource issues. For programs in tier-one states, the following issues were rated by at least half of administrators as difficult or very difficult: soil erosion and sedimentation, ground or surface water quantity, land development and conversion, fisheries, and mineral mining. For programs in tier-two states, the following issues were rated by about half of administrators as difficult or very difficult: ground or surface water quality, ground or surface water quantity, and wetlands. These results may help understand the technical barriers to assessing different natural resource issues. If a particular issue is not assessed because it is difficult to assess it, efforts may be needed to improve state programs' understanding of that issue and their assessment ability.

Scales, Baselines, and Criteria for Assessing Cumulative Impacts

Administrators were asked to identify the geographic scales, time scales, baseline conditions, and significance criteria used for assessing cumulative impacts. They were also asked to rate the usefulness of these scales, conditions, and criteria on a four-point scale with 1 being "not useful" to 4 being "very useful." Among 17 state programs with requirement for using geographic scales, 16 have implemented associated requirements. The implementation rate is 83% among programs in tier-one states and 100% among programs in tier-two states. In addition, four programs in tier-one states and one program in tier-two states voluntarily adopted specific geographic scales in their CIA process. State-by-state details are presented in Table 6. The three

most commonly used scales in both tiers are: (1) the immediate site of a proposed project; (2) a political unit often referred to a county or municipality; and (3) a watershed in which a proposed project is located. Despite their frequency of use, a project site and a political unit were considered minimally useful by administrators, while a watershed was rated as the most useful geographic scale. One interesting finding is that ten administrators rated an ecoregion as a useful or very useful scale even though this scale has not been frequently used in actual analyses. An ecoregion is defined as a “large unit of land or water containing distinct natural communities and environmental conditions,” within which a proposed project may have effects (WWF, 2008). If ecoregion is indeed a useful scale, efforts may be needed to increase the practice of assessing cumulative impacts on an ecoregion basis.

As previously discussed, 17 programs assessing cumulative effects have time scale requirements. The administrators of these programs indicated that the implementation of these requirements has been variable. Additionally, three programs in tier-one states and five programs in tier-two states have voluntarily adopted specific time scales in their CIA process. State-by-state details are presented in Table 7. The survey results show that 12 programs assessed cumulative impacts within the context of past actions, and an additional 12 took into account future actions when conducting CIA. The percentage of programs in each tier that considered past and future actions is similar, approximately 65%. There is no evidence showing that programs in one tier were doing a better job of utilizing time scales for assessing cumulative impacts than programs in another tier.

Administrators were also asked to identify commonly used times scales for three types of proposed economic development activities. For projects that have a defined life such as power plants, the most commonly used scale is a project’s construction and operation period, which was rated by the majority of program administrators as useful or very useful for assessing cumulative impacts. For projects that do not have defined lives such as residential development, half of state programs assessed cumulative impacts within a project’s construction period, while the other half went beyond the construction period. Despite the equal popularity, looking beyond the construction period was considered more useful than limiting CIA within the construction period by a majority of administrators. Finally, for plans and policies that do not contain specific timelines, the time scales used for assessing cumulative impacts differed greatly among programs. Some have adopted specific scales varying from 5- to 30-year periods. Others have adopted scales in more general terms varying from a policy formulation period to a policy formulation and implementation period. More programs in tier-one states have adopted time scales for plans and policies than programs in tier-two states. However, regardless of tier, administrators generally considered the specific scales their programs adopted for plans and policies useful or very useful for assessing cumulative impacts.

Regarding baseline requirements, the percentage of programs in tier-one states that have implemented these requirements is higher (100%) than the percentage of programs in tier-two states (70%). Additionally, four programs in tier-one states and one in a tier-two state have voluntarily adopted baselines for conducting CIA. Table 8 summarizes the practices of using baselines across programs. The baselines adopted are of two types: (1) current environmental condition before implementing a proposed project; and (2) future environmental condition without implementing a proposed project. Most programs used both types, while two of them

used only the current condition and one used only the future condition. Administrators from both tiers considered the current condition as more useful than future condition. However, scientifically speaking, the future condition may be more appropriate for assessing cumulative impacts than current condition. Assessing cumulative impacts based on future condition makes the effects of past and future activities contributors to cumulative impacts, while assessment based on current condition makes the effects of past activities part of the baseline rather than contributors, and also ignores the potential impacts of future activities (McCold and Saulsbury, 1996). Strategies may be needed to improve administrators' understanding of using future condition as baseline and increasing its appropriate use.

Finally, with respect to determining the significance of cumulative impacts, administrators from tier-one states felt that their formal criteria were minimally useful, while seven of the eight administrators from tier-two states considered their criteria to be useful or very useful. Among programs without formal criteria, approximately 65% have adopted certain measures for determining unacceptable cumulative impacts. These programs heavily relied on opinions of the environmental review document preparer, and of experts within the responsible government agency or from consulting firms. In addition, a great number of administrators reported taking mitigation measures into account when making significance decisions. For example, if certain mitigation measures can be taken to reduce the cumulative impact level below the significance threshold, a proposed project is not judged to have significant cumulative impacts.

Data Gathering and Analytic Methods

Administrators were asked to rate the degree to which their data gathering and analytic methods reflected qualitative or quantitative measures, using a four-point scale with 1 being "entirely qualitative" to 4 being "entirely quantitative." Among the 27 administrators who responded to the question, four reported that only qualitative or only quantitative methods were used, while others have generally adopted mixed methods for data collection and analysis. In addition, 15 administrators, seven from tier-one states and eight from tier-two states, reported mostly or entirely qualitative methods, while 12 administrators, equally split between tier-one and tier-two states, reported mostly or an entirely quantitative approach. This result shows that the use of qualitative methods is slightly more prevalent than the use of quantitative methods, which is contrary to past research suggesting quantitative methods are more appropriate for CIA and should be used more often than qualitative methods (McCold and Holman, 1995; Cooper and Canter, 1997a; Burris and Canter, 1997a).

In a follow-up question, a list of methods identified in the literature was presented. On a five-point scale with 1 being "never used" to 5 being "always used," administrators from tier-one states identified modeling as the most frequently used method for assessing cumulative impacts, followed by an environmental checklist and Geographic Information System (GIS) techniques (Figure 1). Among administrators from tier-two states, GIS was identified as the most frequently used method followed by an environmental checklist and trends analysis. Besides environmental checklist, aforementioned methods are all quantitative methods. Further studies are needed for understanding choices of methods used for assessing cumulative impacts and identifying strategies to increase the use of quantitative approach in order to promote accurate assessments of cumulative impacts.

Coordination Among Government Units

All the state programs with requirements for intergovernmental coordination have implemented associated requirements for CIA. Additionally, nine programs, including five in tier-one and four in tier-two states, have voluntarily adopted procedures to coordinate the assessment of cumulative impacts in their environmental review process. State-by-state details of these coordination approaches are presented in Table 9. Administrators were asked to indicate the extent to which coordination occurs among local, state, and federal government units when assessing cumulative impacts. The extent of coordination was rated on a 4-point scale with 1 being “no occurrence” to 4 being “extensive occurrence.” Figure 2 compares the results by the two tiers. As previously discussed, one would expect to see more extensive coordination to occur in tier-one states. However, Figure 2 illustrates that coordination actually occurred less extensively among different government units in tier-one than in tier-two states. In addition, coordination in both tiers has primarily occurred among state agencies and between state and federal agencies, and less between state agencies and local units of government.

In summary, state environmental review programs have adopted different measures for implementing their CIA policies. For programs in tier-one states, cumulative impacts were often assessed in an EA or EIS document, and some programs have adopted alternative forms of documentation particularly for assessing cumulative impacts. In contrast, programs in tier-two states, instead of completing a NEPA-like EA or EIS, often assessed cumulative impacts in their own forms of documentation prepared as part of an application for state permits or funds. Programs in the two tiers also had different focus on the types of natural resource issues assessed within a CIA context. Issues related to wetlands and land development and conversion were assessed by the majority of programs in tier-one states, while issues related to soil erosion and sedimentation and wildlife were more common to programs in tier-two states. With respect to specific procedural requirements for CIA, the majority of programs have implemented these requirements, and programs in the two tiers had similar level of implementation. Additionally, several programs in tier-one and tier-two states have voluntarily adopted procedures for using specific scales and baselines, as well as coordinating among local, state and federal agencies in order to effectively assess cumulative impacts. Finally, state programs have adopted a mix of quantitative and qualitative methods for gathering and analyzing data in a CIA process, although qualitative methods seemed to be slightly more popular than quantitative methods.

Understanding the Relationship between CIA Policy and its Implementation

For the examination of CIA policy attributes, 26 programs were included in the analysis. Programs in Maine, South Dakota, and Virginia were excluded from the analysis due to missing values. A correspondence map was produced to illustrate the associations among different CIA policy attributes on a two-dimensional space (Figure 3). Fifty-seven percent of the variation among state programs was explained by the variables used in the analysis, with 35% relative to the first dimension and 22% to the second dimension, indicating that the analysis was exploratory and some variables that may describe CIA policy framework were not considered in this study. The correspondence map shows that the category values indicating adoption of cumulative impact definition, adoption of time scale, geographic scale, and baseline requirements, adoption of formal significance criteria, and adoption of intergovernmental

coordination requirements are located to the left of the vertical zero line, suggesting a homogeneity among these examined CIA policy requirements. In another word, findings indicate that programs with one specific procedural requirement also tend to have other procedural requirements.

With respect to CIA practices, MCA was performed using data from 16 state programs. Thirteen programs were excluded from the analysis because of incomplete responses to the survey questionnaire. Forty-six percent of the variation among state programs was explained by the variables used in the analysis, with 29% relative to the first dimension and 17% to the second dimension (Figure 4). Unlike CIA policy attributes, the attributes of CIA practices do not show a clear pattern. Looking at the correspondence map, the top-right quadrant suggests associations among consideration of past projects, failure to use current condition as baseline, use of qualitative CIA methods, minimal coordination among state agencies, minimal coordination between state and federal agencies, and no coordination between state and local agencies. Proceeding clockwise, use of geographic scales, consideration of future projects, failure to use future condition as baseline, and extensive coordination among state agencies are associated. The bottom-left quadrant shows the associations among failure to consider past projects, use of current condition as baseline, use of mixed methods, extensive coordination between state and federal agencies, and minimal to moderate coordination between state and local agencies. The last quadrant shows the associations among failure to use geographic scales, failure to consider future projects, use of future conditions as baseline, moderate coordination among state agencies, moderate coordination between state and federal agencies, and extensive coordination between state and local agencies. By examining the four quadrants, as well as the two sides of the vertical zero line, the correspondence map suggests that there are no clear patterns among different attributes of CIA practices and that the implementation of one procedure does not directly relate to the implementation of other procedures.

Further analysis was conducted to explore the relationship between CIA policy development and its level of implementation. Again, data from 16 programs were used for the analysis and 13 programs were excluded due to missing values. The correspondence map in Figure 5 shows that 36% of the variation among state programs was explained by the variables used in the analysis, with 23% relative to the first dimension and 13% to the second dimension. Two patterns were observed. First, the top-right quadrant shows the associations among no requirements for intergovernmental coordination, minimal coordination among state agencies, minimal coordination between state and federal agencies, and no coordination between state and local agencies. This indicates that the lack of coordination requirements is directly related to the lack of coordination among different units of government. Second, the bottom-right quadrant suggests a relationship between lack of baseline requirements and failure to adopt current or future condition as baseline. Alternatively, the top-left quadrant suggests a relationship between adoption of baseline requirements and the actual practices of using current or future condition as baseline. This indicates that having baseline requirements directly contribute to the use of baseline in a CIA process. In summary, the analysis suggests that there is a relationship between CIA policy development and its level of implementation, particularly regarding the adoption of baseline condition and coordination among government units. However, because no patterns were observed for other attributes of CIA policy and implementation, this analysis also suggests that not all the procedural requirements result in the actual practices of the procedures.

Finally, state program identifiers were overlaid on the correspondence map in Figure 5. The new correspondence map shown in Figure 6 demonstrates the commonalities and differences among programs. One grouping of programs, including seven programs in tier-one states (Connecticut, Massachusetts, Montana, New York, New Jersey, Washington, and Wisconsin) and four in tier-two states (Florida, Illinois, Texas, and Utah) are clustered to the left of the vertical zero line, indicating they share many common characteristics. These programs tend to have specific baseline requirements, and use current or future baseline condition in their CIA process. They tend to require and practice coordination among local, state and federal agencies. They also tend to use mixed methods for data collection and analysis. Besides this group, a small group of three programs in tier-two states (Florida, Kentucky, and Mississippi) was also identified sharing certain characteristics. For example, these programs tend to not have time scale requirements, and generally use qualitative methods in their CIA process. The Delaware and Maryland programs did not group with other states, suggesting they have little in common with others regarding the assessed policy and practice attributes.

Comparing the four quadrants in the correspondence map and identified groups suggests no considerable difference between programs in tier-one states and programs in tier-two states. In fact, programs in the two tiers tend to share many common characteristics regarding specific CIA requirements adopted and the actual practices of certain procedures. These findings indicate that the categorization of states into two tiers based on the breadth and depth of their environmental review policies does not account for all the variability with respect to CIA efforts among programs in the two tiers, and in fact may be an inaccurate dichotomy. This study shows that although programs in tier-one states generally have more comprehensive and consistent environmental review policies than programs in tier-two states, they do not necessarily imply more stringent CIA requirements or extensive implementation than programs in tier-two states. Therefore, the mechanism by which state environmental review programs require the assessment of project-specific environmental impacts, although informative, is not a determinant of state CIA policy and actual practices.

Conclusion

The importance of assessing cumulative impacts of proposed projects in an environmental review process is well recognized (Roots, 1986; Canter and Canty, 1993; Rees, 1995; Burris and Canter, 1997a, Hegmann et al., 1999). Because of such importance, many studies have been conducted to examine CIA efforts in the federal NEPA process (Herson and Bogdan, 1991; McCold, 1991; Clark, 1994; McCold and Saulsbury, 1996; Burris and Canter, 1997b; Cooper and Canter, 1997b; Eccleston, 2001). However, little is known about which states require CIA and even less about their CIA practices. Through a review of state environmental review laws, administrative rules and agency-prepared materials and a survey of state environmental review program administrators, this study contributes to the literature by describing the landscape of CIA policies and practices within state governments. Generally speaking, the majority of state programs that have adopted environmental review policies also have formal requirements for assessing cumulative environmental impacts. Of these programs, more than half have adopted specific procedural requirements, such as for using specific geographic or time scales, baselines, criteria, or analytic methods. Surprisingly, the percentage of programs in tier-one states with

these specific procedural requirements is lower than the percentage of programs in tier-two states. This suggests that programs in tier-one states, while have more comprehensive and consistent environmental review policies, may be less thorough than programs in tier-two states with respect to their requirements for assessing cumulative impacts.

Regarding the implementation of CIA policies, state programs have adopted different measures. Programs in tier-one states generally assessed cumulative impacts using a standard NEPA-like EA or EIS, while programs in tier-two states generally used their own environmental review documentation that is incorporated into an application for state permits or funds. The majority of programs in both tiers have adopted specific scales, baselines, criteria, and coordination practices for assessing cumulative impacts. Several other programs have also voluntarily adopted procedures to facilitate their CIA efforts. Mixed methods for data collection and analysis were used in most programs with the use of qualitative methods more prevalent than quantitative methods.

In addition to describing the landscape of CIA requirements and practices, this study examines the associations among attributes of CIA policy as written and its implementation. Generally speaking, programs with one particular procedural requirement are likely to adopt other procedural requirements. However, the implementation of one procedure does not directly relate to the implementation of specific others. Additionally, certain relationship between CIA policy and its implementation was observed. In particular, requirements for using baselines and coordination among government units are associated with how state governments implemented these procedures. However, it is important to keep in mind that not all the procedural requirements necessarily result in the implementation of the procedures. Finally, the analysis shows that programs in the two tiers share many common characteristics regarding their CIA efforts with no consistent patterns observed between programs in tier-one and tier-two states. This suggests that a state program with comprehensive and consistent environmental review policies and procedures does not necessarily imply extensive CIA requirements and practices. The categorization used for state environmental review framework may not be accurate for characterizing state-level CIA efforts.

Understanding the current landscape of CIA policies and practices within the context of state environmental review is the first step to curbing accumulated environmental degradation caused by development activities over time and space. To improve the effectiveness of state environmental review efforts, it is important to adapt existing review procedures so that: (1) cumulative environmental impacts can be accurately predicted; (2) government agencies are informed in their decision making processes for adopting a new plan or issuing a new permit; and (3) predicted cumulative impacts can be effectively minimized. Because of the great variation among state programs regarding their levels of CIA efforts, no one solution exists for improving the quality of the assessments across programs. More efforts are needed on a program-by-program basis for identifying barriers to CIA policy implementation and strategies to promote good practices. Meanwhile, emphasis needs to be given to specify existing CIA procedural requirements and to provide practical guidance to assist project proposers and responsible government units in their efforts to better implement existing policies.

Finally, it is worth pointing out the potential for promoting CIA efforts in states that do not conduct environmental reviews for proposed economic development activities. As discussed, the level of environmental review in a state does not directly relate to the level of CIA efforts. This suggests the possibility of promoting CIA requirements and practices in states without establishing comprehensive environmental review framework. Because it may be easier to adopt specific CIA procedures than to adopt an entire environmental review framework, a state may incorporate relevant CIA requirements into its existing permitting and funding processes so that important cumulative impacts will be taken into account, even when a full environmental review is not prepared.

CHAPTER 4

INTEGRATING CUMULATIVE IMPACT ASSESSMENT INTO STATE ENVIRONMENTAL REVIEW FRAMEWORKS: BARRIERS AND OPPORTUNITIES

Introduction

Cumulative environmental impact is defined as the incremental impact of a single activity on the environment assessed in the context of other past, present, and foreseeable future activities, regardless of what agency or person undertakes such other activities (Smit and Spaling, 1995). CIA is the process of systematically analyzing and evaluating a proposed project's cumulative environmental impacts. The practice of CIA is recognized by environmental practitioners as an essential tool to facilitate sound environmental planning and management (CEQ, 1997). For example, in a forestry context, forestry projects (e.g., paper mill operations, furniture workshops) may draw wood fiber from many small logging operations located in geographically dispersed areas. Although an individual logging operation may impose relatively benign environmental consequences, the cumulative impacts of logging operations over time and across state can be substantial (Kilgore and Ek, 2007). Thus, it is important to analyze, evaluate, and mitigate such cumulative impacts prior to undertaking proposed forestry projects. Insufficient consideration of cumulative impacts could result in damage to the forest and associated resources on a range of scales from local through state to national and even global (Roots, 1986). Legally and administratively, CIAs have been addressed within environmental review frameworks.

Environmental review has been institutionalized in the US over the past three decades. At the federal level, the NEPA provides a comprehensive framework for federal agencies to assess the environmental impacts of their proposed activities prior to their undertaking. Within state governments, formal environmental review policies have been established in 37 states requiring the integration of environmental evaluation and project planning for economic development activities proposed, permitted, or funded by state and/or local government. To date, environmental review efforts at both federal and state levels have focused primarily on assessing environmental impacts on a project-by-project basis.

One area of environmental review that has received increased attention is the assessment of cumulative environmental impacts. The extent to which CIA is integrated into an environmental review process often has considerable influence on the adequacy of the documentation to fully describe and characterize the nature and extent of anticipated environmental impacts. When a proposed project is evaluated, a key issue is to determine whether the project has potential significant environmental impacts. If only project-specific impacts are assessed, potentially significant cumulative impacts may be overlooked, even though such impacts may have been a key factor in determining the need for conducting further environmental studies, or determining whether relevant permits or funds shall be granted (Canter and Canty 1993; Burriss and Canter, 1997a; Hegmann et al., 1999). Therefore, failure to integrate CIA into an environmental review process compromises the utility and credibility of the process (Roots, 1986; Rees, 1995).

Despite the importance of assessing cumulative impacts, the practice of CIA in formal environmental review processes is insufficient in the US (Canter and Kamath, 1995). This paper

aims at identifying the barriers to and opportunities for effective CIA practices within the context of environmental review processes, in particular those that are carried out at the state level. Specifically, this paper provides a review of CIA policies and practices across the country, identifies the information void with respect to insufficient understanding of CIA efforts among state governments, discusses the practical challenges that confront state environmental review program administrators as they attempt to incorporate CIA into their programs, and describes strategies for effectively integrating CIA practices within existing state environmental review frameworks.

The Practice of CIA in the US

Considerable effort has been made at the federal level to help environmental planners identify and describe cumulative impacts when preparing environmental review documents. In 1997, the CEQ published a handbook titled *Considering Cumulative Effects under the National Environmental Policy Act* to provide a general framework for incorporating CIA as part of the federal NEPA process (CEQ, 1997). In 1999, the Environmental Protection Agency (EPA) conducted a study titled *Consideration of Cumulative Impacts in EPA Review of NEPA Documents* to assist NEPA document reviewers in providing accurate, realistic, and consistent comments on the assessment of cumulative impacts (EPA, 1999). In 2002, the National Cooperative Highway Research Program published a report titled *Desk Reference for Estimating the Indirect Effects of Proposed Transportation Projects* to identify various types of indirect and cumulative effects, and establish an analytical framework for federal agencies to estimate the effects of proposed transportation projects (NCHRP, 2002).

In spite of the effort to promoting federal CIA practices, cumulative impacts have been only marginally considered in the NEPA process (Canter and Kamath, 1995). McCold and Holman (1995) reviewed 89 environmental assessments (EAs) published in the Federal Register in 1992 and found that only 39% of the EAs provided evidence that cumulative impacts were taken into account. Burris and Canter (1997a) systematically reviewed cumulative impact considerations in environmental review documents prepared on a variety of projects under NEPA regulations. They found that cumulative impacts were neither normally mentioned nor thoroughly analyzed in these documents. In another study, Burris and Canter (1997b) conducted a survey of environmental review practitioners in the US and reported that CIA was a widely supported concept across the country, but that the measurement of even basic cumulative impacts was addressed in less than half of the federal projects reviewed.

Researchers have suggested that insufficient CIA practices in the NEPA process may be due to: (1) the technical difficulties associated with assessing cumulative impacts; and (2) a lack of political and institutional mechanisms and support for incorporating CIA into the NEPA process. Regarding the technical difficulties, three major concerns arise. First is the difficulty in defining the time and geographic scales for assessing cumulative impacts. There is a general agreement that relevant past and future actions contribute to cumulative impacts, but it is uncertain as to how far into the past and future to analyze those impacts (McCold and Saulsbury, 1996). In terms of defining geographic scales, if a large scale is defined, only a superficial assessment may be possible and uncertainty will increase; if a small scale is defined, a more detailed CIA may be feasible but an understanding of the broad context may be sacrificed (CEAA, 1994). Second, it is

difficult to determine appropriate baselines for CIA. Common practice is to consider the existing environmental condition as the baseline for assessing project-specific impacts; however, this may not be appropriate for CIA because it makes the effects of past actions part of the baseline rather than contributors to cumulative impacts (McCold and Saulsbury, 1996). Finally, existing methodologies for CIA are not always practical, feasible, or even effective (Cooper and Canter, 1997a). Cocklin and colleagues (1992) reviewed a selection of methods. The most commonly used methods are environmental checklist and matrix. A checklist is simply a list of environmental effects and impact indicators that acknowledge a proposed project's potential for environmental impacts, but with little or no attempt made to assess cumulative impacts (Cocklin et al., 1992). Matrix approaches are normally achieved whereby project activities are listed along one axis and effects are listed along the other. Because cumulative impacts are not necessarily additive, a summation of the matrix values may not provide an accurate measure of nonadditive cumulative impacts (Cocklin et al., 1992).

Lack of political and institutional mechanisms and support may also contribute to insufficient CIA practices. For instance, Burris and Canter (1997a) suggest the absence of specific requirements or uncertainty as to what to address is a challenge for preparing CIA documents. Cooper and Canter (1997b) conducted a review of 33 environmental impact statements (EISs) prepared by federal agencies and found that lack of CIA procedures contributed to insufficient assessment of cumulative impacts in all the EISs reviewed. Insufficient CIA may also be due to lack of collaboration among private project proposers. Because environmental review is often limited to individual ownerships, the analysis of environmental impacts is often limited to the site and lifespan of a proposed project (Ziemer, 1994). There is no established system that encourages collaboration among project proposers and that helps them to gather information in a CIA process regarding other projects and their effects, particularly when it involves business competitors (Dubé, 2003). Another important inhibitor may be a lack of coordination among federal agencies (Burris and Canter, 1997b). A CIA process requires considerable information and technical expertise, in which coordination facilitates the sharing of data and obtaining technical support among different agencies. Without coordination, an agency alone may not be able to assess cumulative impacts and therefore, may opt not to include CIA in its NEPA documents at all. In addition, shrinking budgets and increasing workload of federal agencies also inevitably affects the practice of CIA (João, 2002). Finally, insufficient CIA may be due to a lack of public awareness of CIA's importance. Because cumulative environmental changes are incremental, cumulative impacts can be disregarded until the environmental or social consequences are considerable, exceed a certain threshold, or yield catastrophic outcome (Tollefson and Wipond, 1998).

Researchers have suggested ideas for overcoming some of these barriers. Clark (1994) suggested developing a national environmental baseline database. This would require coordination among different levels of governmental agencies to collect environmental data by ecological region, store these data based on common protocols, and share access to these data. In addition, Clark (1994) suggested that the International Association of Impact Assessment, one of the most experienced and knowledgeable environmental review related organizations, could lead an effort to develop a CIA handbook containing methodological guidelines and case studies allowing practitioners to learn from one another. Cooper and Canter (1997a) suggested establishing an environmental monitoring program as part of existing environmental review procedures.

Environmental data collected through monitoring would become part of the baseline data for future CIA in the NEPA process.

These studies are informative for understanding CIA policies and practices governed by federal environmental review requirements (e.g., NEPA). However, many economic development activities occur as a result of nonfederal actions whose CIA is governed by state environmental review policies and procedures. Currently, 37 states in the union have adopted formal environmental review policies and are categorized into two tiers according to the breadth and depth of their policies (Table 1). Tier-one includes 16 states that mandate a systematic review of non-federal economic development projects. These policies mimic in scope and intensity of the federal NEPA (Sullivan, 2004), and require the preparation of environmental review documents following the NEPA model. For example, in Minnesota an EA- or EIS-like document is required for projects proposed, permitted, or funded by state and local governments, as long as they are not exempt by state law or rules. Tier-two includes 21 states that require an environmental analysis of proposed projects as part of a permitting or funding process. Unlike the policies adopted by tier-one states, tier-two state policies are specific to different natural resource sectors, such as forestry or mining, and are only applicable under certain circumstances. For example, in Michigan a special-use permit is mandatory for housing, commercial, and industrial development projects located in critical sand dune areas. In order to obtain such a permit, an environmental evaluation is required as part of the permit application.

In these 37 states with formal environmental review policies, 50 active programs have been identified, among which 29 contain explicit provisions for incorporating CIA into their environmental review procedures. Yet, the extent to which cumulative impacts are analyzed and evaluated in practice varies greatly from one program to another. For example, some programs only discuss a proposed project's cumulative impacts on a specific natural resource, while others comprehensively examine a full range of environmental and natural resource conditions when conducting CIA. Some programs require CIA without specification, while others have adopted procedural requirements for using specific scales, baselines, and criteria. Other substantive differences exist regarding the focus on an immediate site of a proposed project or adoption of a larger geographic scale such as a county or watershed where a project is located. In addition, some programs consider foreseeable future actions in their CIA process, while others look both retrospectively and prospectively. The types and extent of qualitative and quantitative methods used for data collection and analysis also vary among programs. Finally, some programs give little attention to intergovernmental coordination, while others have established extensive procedures to facilitate coordination among federal, state and local agencies for assessing cumulative impacts.

What has not been discussed in the literature are the practical challenges that confront state environmental review program administrators as they attempt to incorporate CIA into their programs. This paper aims to fill this information void by (1) identifying the perceived barriers to and opportunities for effective implementation of CIA policy among state administrators; (2) examining the attributes of CIA policy requirements that affect administrators' perceptions of CIA barriers and opportunities; and (3) discussing the implications for improving states' abilities to predict and minimize adverse cumulative environmental impacts within the context of environmental review. Lessons learned from different states based on information collected from

this study can assist states' efforts in strengthening existing procedures to address the growing recognition of the critical impacts illuminated by a CIA.

Data

The data used in this study were drawn from a national mail survey of state environmental review program administrators². The purpose of the survey was to obtain information about the procedural requirements for conducting CIA at the state level, the practices of CIA, and perceived barriers to and opportunities for incorporating CIA into state environmental review process. The procedural requirements and practices of CIA were described in Chapter 3. The perceived barriers and opportunities are the focus of this study.

The design of the survey questions with respect to CIA barriers and opportunities was guided by aforementioned studies focusing on challenges and potential for federal agencies. It is also guided by Sabatier and Mazmanian's (1981) framework for policy implementation analysis, which suggests that the identified challenges and potential for federal agencies may also apply to state efforts, and provides assistance in identifying additional factors that may hinder CIA at the state level. The factors affecting policy implementation can be divided into three broad categories: (1) the tractability of the issue being addressed by a policy; (2) the ability of a policy to favorably structure its implementation; and (3) various political variables. As applied to incorporating CIA into state environmental review framework, the tractability of the issue refers to how explicit the issue of cumulative impacts is addressed in state law and administrative rules. If the legal requirement for incorporating CIA into state environmental review procedures is ambiguous, state agencies will feel little obligation to implement it. To assess the ability of a CIA policy to favorably structure its implementation requires attention to whether such policy provides clear definition of cumulative impacts, explicit procedures for assessing cumulative impacts, as well as sufficient timeframe and financial resources enabling a state environmental review program to implement the policy. Without these elements, programs will unavoidably encounter difficulty in gathering and analyzing data, evaluating predicted cumulative impacts, and adopting relevant mitigation measures. Also related, effective CIA policy implementation depends on various political variables, in particular the attitudes toward the need for CIA as reflected by the business community, media, affected public, as well as state program staff. Lack of recognition of the importance of assessing cumulative impacts among constituents or program staff may contribute towards ineffective CIA practices.

Guided by this framework and the literature, a list of potential barriers to effective implementation of state CIA policy was developed and organized into four categories. The first category addresses the tractability of the issue. Potential barrier in this category includes ambiguous requirements for assessing cumulative impacts provided by state law and

² The questionnaire sent to the administrators from the two tiers of states is slightly different. For administrators from tier-one states, only CIA-related questions were asked, while for administrators from tier-two states, a set of questions on general environmental review procedures and practices was also added to the questionnaire. A copy of the questionnaire and cover letter used in tier-one states can be found respectively in Appendices A and B. A copy of the questionnaire and cover letter used in tier-two states can be found respectively in Appendices C and D.

administrative rules. The second category addresses the ability of CIA policy to favorably structure its implementation. Potential barriers relate to a lack of clear definition, explicit procedures, practical criteria, adequate staff, reasonable timeframes, as well as alternative forms of reviews for assessing cumulative impacts. The third category addresses the technical difficulties associated with a CIA process. Potential barriers relate to inadequate understanding of appropriate scales and baselines, lack of analytic methods, and lack of necessary data and access to data, and insufficient technical expertise. Finally, political and institutional factors may also hinder the implementation of state CIA policy. In particular, potential barriers include insufficient intergovernmental coordination, and negative attitudes toward CIA as reflected by the business community, general public, or environmental review program staff.

Input on a draft of the survey questionnaire, including the lists of potential barriers and ideas for improvement, was solicited from individuals familiar with state environmental review and CIA policies and programs. The mail survey was administered between June and October 2007 following the method described by Dillman (2000). Efforts were made in this study to continue contacting administrators who failed to respond to the survey after the final reminder letter. A weekly correspondence with these administrators was made via email or phone until they completed the questionnaire or decided not to participate in the study.

Of the 50 administrators contacted, 38 completed the questionnaire with a response rate of 76%, including 29 from programs requiring CIA as part of their state environmental review process and nine from programs without CIA policies or procedures. Although no formal test for non-response bias was performed, it is reasonable to believe that the difference between respondent and non-respondent programs is minimal due to the facts that: (1) a reasonably good response rate of 76% was achieved; (2) no clear difference was observed between respondent and non-respondent programs with respect to their levels of requirements for assessing both project-specific and cumulative environmental impacts of proposed projects.

Responses from the 29 programs with CIA policies and procedures were used for identifying perceived barriers to and opportunities for effective CIA policy implementation. Responses from the nine programs without CIA policies and procedures do not contain information about barriers and opportunities, but provide information that may help identify concerns about adopting CIA practices in non-participating states. This information, though limited, provides an opportunity for gaining a preliminary understanding of the reasons why these programs do not consider cumulative impacts within the context of environmental review.

An Empirical Model for Predicting Barriers and Opportunities

This study also examines which aspects of CIA policy requirements may affect administrators' perceptions of CIA barriers and opportunities. The hypothesis is that CIA policy requirements affect what administrators consider as barriers to and opportunities for effective policy implementation. These policy requirements include the following attributes. First is the requirement for using specific geographic and time scales for evaluating cumulative impacts. Second is the requirement for defining an appropriate baseline for the affected resources so that the magnitude of cumulative impacts can be determined. The third attribute relates to adopting formal criteria for determining severity of predicted cumulative environmental impacts. The last

attribute is the requirement for intergovernmental coordination as a mean to encourage the sharing of data and technical expertise among agencies. Together, these attributes are used for choosing the explanatory variables for predicting perceived barriers to and opportunities for effective policy implementation. In addition, the tier to which an environmental review program belongs helps characterize the program's assessment procedures for cumulative impacts. Thus, it may also affect the perception of a program administrator. Therefore, tier was also chosen as an explanatory variable.

The empirical model for predicting perceived barriers is:

$$\text{BARRIER} = f(\text{TIER}, \text{REQGEO}, \text{REQTIME}, \text{REQBASE}, \text{FORCRI}, \text{REQCOOR})$$

The empirical model for predicting perceived opportunities is:

$$\text{OPPORTU} = f(\text{TIER}, \text{REQGEO}, \text{REQTIME}, \text{REQBASE}, \text{FORCRI}, \text{REQCOOR})$$

The response variable for the first model, BARRIER, represents whether or not a potential barrier was perceived by an administrator as a major barrier. Originally, each potential barrier was rated by program administrators on a four-point scale, from 1 being "not a barrier" to 4 being "significant barrier." For the purpose of this analysis, the first two categories—"not a barrier" and "minimal barrier"—collapsed into a new category—"not a barrier," and the third and fourth categories—"moderate barrier" and "significant barrier"—collapsed into a new category—"major barrier." With the new binary categorization, the response variable BARRIER takes the value 1 if a potential barrier was perceived as a major barrier and 0 otherwise. Similarly, the response variable for the second model, OPPORTU, represents whether or not a potential idea for improvement was identified by an administrator as a useful opportunity. Each potential idea was originally rated on a 4-point scale and again, for the purpose of this study, the four categories collapsed into two. With the new binary categorization, the response variable OPPORTU takes the value 1 if a potential idea was perceived as a useful opportunity and 0 otherwise.

All the explanatory variables in the two models are binary. The first one, TIER, represents whether an environmental review program is from a tier-one or tier-two state. It takes value 1 if a program is from a tier-one state and 0 if from a tier-two state. The other explanatory variables are related to specific procedural requirements for CIA. REQGEO represents whether or not a program requires the use of specific geographic scales. REQTIME represents whether or not a program requires the use of specific time scales. REQBASE represents whether or not a program has adopted requirement for defining baseline. FORCRI represents whether or not a program has established formal significance criteria. REQCOOR represents whether or not a program requires intergovernmental coordination. These variables take value 1 if a program has the requirement for a particular procedure and 0 otherwise.

Binary logistic regression procedures were used to estimate the empirical model. A simple illustration of the logistic regression model is:

$$\text{logit}(Y) = \alpha + \beta\bar{X}$$

where:

Y is an outcome of interest

α is a constant

$\bar{\beta}$ is a vector of regression coefficients

\bar{X} is a vector of explanatory variables

Probabilities are assigned for the two possible outcomes in the response variable. The probability of a barrier or opportunity being identified by a program administrator is:

$$\pi_i = P(Y_i = 1 | \bar{X}_i) = \frac{e^{\alpha + \bar{\beta}\bar{X}_i}}{1 + e^{\alpha + \bar{\beta}\bar{X}_i}} = \frac{1}{1 + e^{-(\alpha + \bar{\beta}\bar{X}_i)}}$$

Logistic regression procedures are appropriate for analyzing data from a random sample in order to make inferences about the population. In this study, a questionnaire was sent to 50 state environmental review programs across the US in an attempt to obtain information from all programs that have adopted formal CIA policies and procedures, which is the population of interest. Survey results identified 29 such programs, which are not a random sample, but rather represent the entire population. Recognizing this fact, this study employed logistic regression procedures as an exploratory tool to examine the data in an attempt to illuminate understanding of the influence of state CIA policy requirements on administrators' perceptions of barriers and opportunities. As such, the results of the logistic regressions, in particular the significance of the coefficients, should be interpreted with caution.

Results

Perceived Barriers to Effective CIA Policy Implementation

Administrators were asked to identify barriers to CIA policy implementation. The results are summarized in Table 10. The three potential barriers that received the highest ratings are: ambiguous definition of cumulative impacts with an average rating of 2.96, lack of explicit CIA procedures with an average rating also of 2.96, and lack of data and information needed to conduct CIA with an average rating of 2.88. An interesting pattern observed in the responses between administrators from tier-one and tier-two states was that although administrators had similar perspectives regarding barriers, those from tier-one states generally rated each potential barrier as more significant. In particular, a third of potential barriers were rated by administrators from tier-one states as moderate or significant, while none were identified as a major barrier among administrators from tier-two states.

In addition, three logistic regressions were performed to respectively examine the influence of CIA policy requirements on the identification of the top-three barriers (AMBDEF—ambiguous definition, LACPRO—lack of explicit procedures, and LACDAT—lack of data and information). No correlation among explanatory variables was above 0.53, suggesting no adverse effect on the estimates. Coefficients and z-statistics for each of the three regressions are presented in Table 11. The model $AMBDEF = f(\text{TIER, REQGEO, REQTIME, REQBASE, FORCRI, REQCOOR})$ is significant at $p < 0.01$, suggesting that the model may be useful for predicting the probability of AMBDEF being perceived as a major barrier by administrators. However, closer examination

reveals that standard errors and z-statistics were not produced for five of the six explanatory variables in the model, indicating that the number of observations was too small for the number of variables used. Thus, the AMBDEF model is not really useful for making prediction. The regression results also show that the other two models are not significantly useful for predicting the probability of LACPRO and LACDAT being perceived as major barriers ($p=0.14$ for the LACPRO model and $p=0.40$ for the LACDAT model) and none of the explanatory variables are significant predictors.

An explanation for the regression results, indicating that the level of CIA policy requirements in a program had no influence on the administrator's perception of major CIA barriers, may be that the number of observations was too small to test the model. Two possible solutions to this problem include increasing the number of observations or reducing the number of explanatory variables. Increasing the number of observations is limited by the size of the population of interest. Reducing the number of explanatory variables is not a viable option because the explanatory variables represent the nature of the environmental review framework under which CIA is conducted, as well as equally-important aspects of CIA policy requirements; therefore, they should be either included in the model simultaneously or discarded all at once.

Perceived Opportunities for Improving CIA Policy Implementation

Administrators were also asked to identify opportunities for improving CIA practices. The results are summarized in Table 12. The potential idea that received the highest ratings is developing explicit guidelines for assessing cumulative impacts with an average rating of 3.04. Next is increasing collaboration among various state agencies in a CIA process in addition to the responsible agency for environmental review, which received an average rating of 2.70. Another identified opportunity is providing more explicit requirements for directing the preparation of CIA documents with an average rating of 2.63.

Logistic regression procedures were used to examine the influence of CIA policy requirements on the identification of the top-three opportunities (EXPGUI—developing explicit guidelines, STAINV—increasing collaboration among state agencies, and EXPREQ—providing explicit requirements). Coefficients and z-statistics for each of the three regressions are presented in Table 13. Although the model $EXPGUI = f(TIER, REQGEO, REQTIME, REQBASE, FORCRI, REQCOOR)$ is significant at $p < 0.01$, closer examination reveals that standard errors and z-statistics were not provided for explanatory variables REQGEO and REQBASE. It suggests that the EXPGUI model is not useful for predicting the probability of EXPGUI being considered as a useful opportunity by administrators. Similarly, the regression results show that none of the explanatory variables are significant for predicting the probability of EXPREQ being identified as a useful opportunity. Finally, the model $STAINV = f(TIER, REQGEO, REQTIME, REQBASE, FORCRI, REQCOOR)$ is significant at $p < 0.05$, and two of the six explanatory variables are also significant predictors at $p < 0.10$. This result suggests that whether a program has a requirement for using time scales and for intergovernmental coordination significantly affects the administrator's perception about whether STAINV is a useful opportunity for improving CIA policy implementation. While keeping other explanatory variables constant, the probability of identifying STAINV as an opportunity increases by 80% with the adoption of time

scale requirement. However, the probability decreases by about 60% with the adoption of intergovernmental coordination requirement.

Additional Concerns about CIA

A list of six statements with respect to additional concerns for incorporating CIA into existing environmental review framework was presented to administrators of state environmental review programs with and without CIA policies and procedures. Two statements focus on the perceived value of CIA among administrators. Three statements relate to CIA being a financial burden to businesses and industries, state agencies, and local units of government. The last one concerns the potential for CIA to lengthen a proposed project's environmental review process.

Respondents were asked to rate each statement on a scale of 1 to 4, with 1 meaning strongly disagree and 4 meaning strongly agree with the statement. The responses are summarized in Table 14.

Administrators of programs both with and without CIA policies had positive attitudes toward the value of CIA. Administrators of programs containing relevant requirements generally agreed that CIA enhanced their ability to identify the environmental impacts of a proposed project and improved their decisions about granting relevant permits or state money to a project. Those from programs without CIA requirements recognized the potential value of assessing cumulative impacts as a means for improving the usefulness of their environmental review process in disclosing likely impacts and informing decision making related to a permitting or funding process. Despite similar attitudes toward the value of measuring cumulative impacts, programs with and without CIA policies differed in several important respects. Administrators of the former programs did not consider CIA a financial burden to businesses and industries, state agencies, and local units of government in their states. Nor did they believe that measuring cumulative impacts slowed their environmental review process. Alternatively, administrators of programs without explicit CIA requirements were generally concerned that adopting CIA practices would impose a considerable financial burden, and also extend the time required for conducting an environmental review in their states.

Discussion and Implications

Guided by the literature and Sabatier and Mazmanian's policy implementation framework, this survey-based study developed a four-category framework for characterizing 18 potential barriers to effective CIA. The four categories include the tractability of the issue, the policy's ability to favorably structure its implementation, technical difficulties, and political and institutional factors. Examining the survey results within the context of this framework suggests that state environmental review program administrators understand their legal responsibility for assessing cumulative impacts in an environmental review process and therefore, the tractability of the CIA issue was not considered as an inhibitor to implementing CIA policy. It also suggests that although political factors are generally considered important, they did not seem to be a major concern among administrators in this study. In fact, no barriers in this category were identified as major barriers. What seems to really matter is an environmental review policy framework that favorably and effectively structures CIA implementation, as well as the technical aspects of assessing cumulative impacts. Two of the three primary barriers identified by administrators –

lack of a clear cumulative impact definition and lack of explicit procedures for assessing cumulative impacts—reflect a general inability of CIA policy within existing state environmental review framework to favorably structure CIA implementation. Another primary barrier—lack of data and information—reflects the technical difficulty these administrators face in conducting CIA.

Comparing the responses between administrators from tier-one and tier-two states shows that administrators from tier-one and tier-two states had comparable perspectives with respect to CIA barriers. This suggests similar concerns about implementing CIA policy across programs. In another word, regardless the nature and characteristics of an environmental review program, administrators across the country are facing similar challenges as they attempt to incorporate CIA into their environmental review procedures.

This study also examined potential ideas for improving CIA practices. Two opportunities were consistently identified by the administrators of tier-one and tier-two states. First is adopting explicit guidelines for conducting CIA, which may help overcome one of the major barriers identified by administrators—lack of explicit procedures, thus strengthen CIA policy’s ability to favorably structure its implementation, and eventually contribute to effective implementation of the policy. The second opportunity that was consistently identified by administrators is increasing collaboration among various state agencies with a focus on sharing information and technical resources to facilitate CIA efforts. This also corresponds with the survey result, which indicates that lack of data and information was another major barrier to CIA. If additional agencies with unique data and expertise are involved, they can provide additional data and information as well as technical support to the responsible agency for overseeing the preparation of CIA documents. Therefore, collaboration between the responsible agency and other state agencies may help all parties better understand the environmental conditions of proposed projects, improve their ability to predict potential cumulative impacts, and overcome technical difficulties such as inadequate data and technical expertise. Other ideas were not consistently identified as opportunities among administrators, suggesting these individuals’ perceptions of useful strategies for improving CIA practices are variable. It is also worth noting that although a variety of ideas for improving CIA effectiveness were proposed, most of them were rated minimally useful and only one idea—adopting explicit guidelines—was considered very useful consistently across programs.

In summary, state environmental review program administrators have similar concerns about barriers to effective implementation of CIA policy. The primary barriers identified in this study are related to the inability of CIA policy to favorably structure its implementation, as well as the technical difficulties in assessing cumulative impacts. Different ideas were proposed for overcoming these barriers; however, besides adopting explicit CIA guidelines, no major opportunities were identified consistently across programs.

Additional insights were provided by the logistic regression analysis regarding the CIA policy requirements that affect administrators’ perceptions of CIA barriers and opportunities. The administrator of a program requiring the assessment of cumulative impacts within the context of relevant past and future projects is likely to consider collaboration among various state agencies as a way to improve CIA practices. To implement such a time scale requirement, responsible

government agencies and project proposers need to define an appropriate scale for determining which relevant past and future projects to consider. They may also need to collect necessary data regarding identified past and future projects and their environmental impacts. As previously discussed, more agencies are involved, more data and information may become available. Therefore, if there is a time scale requirement, one way for improving CIA policy implementation will be increasing collaboration among state agencies. Additionally, if a program requires intergovernmental coordination in a CIA process, increasing collaboration is less likely to be considered as a useful way for improving CIA practices. However, it may still be an appealing strategy among programs that have relevant requirements but do not have specific procedures for coordination.

This study also identified the concerns of state environmental review administrators whose programs do not have explicit CIA policies and procedures. These administrators generally recognized the potential value of conducting CIA as a means for improving their environmental review and decision-making process. However, they were concerned about associated financial costs of doing so. Conducting CIA requires extensive data and technical expertise, which may require considerable resources including money and staff time. These costs, which can be considerable, are born either by businesses and industries or by state agencies and local units of government responsible for overseeing the environmental review process. These administrators were also concerned that assessing cumulative impacts would extend the time needed for conducting an environmental review. An agency's action is normally bound by a legal timeframe established by state law and/or administrative rules. For example, it may be required that an environmental review document be completed and associated decisions about requested permits or funds be made within a certain time frame. Assessing cumulative impacts requires additional time for data collection and analysis, which may potentially slow the environmental review and associated permitting or funding process, and result in violating the established legal timeframe. These concerns may help explain why CIA practices have not been adopted by these programs.

Finally, this study suggests that administrators without CIA experience may have overestimated the costs and time needed for conducting CIA. This is based on the survey results indicating that unlike administrators without CIA experience, administrators with CIA experience did not consider the measurement of cumulative impacts a financial burden, nor did they believe it slowed their environmental review process. The different perspectives between administrators with and without CIA experience suggest that strategies are needed for estimating the real costs and time associated with assessing cumulative impacts, explaining it to administrators without CIA experience, and helping reduce their concerns as a mean to encourage the adoption of CIA policy.

Conclusion

Cumulative environmental impact assessment provides an important opportunity for analyzing and mitigating individually minor, yet collectively significant environmental impacts over time and across landscapes. Growing attention has been given to incorporating CIA into existing environmental review framework. Yet, past studies have focused primarily on federal policies and practices (Clark, 1994; Canter and Kamath, 1995; McCold and Saulsbury, 1996; Burris and Canter, 1997a; Burris and Canter, 1997b; Cooper and Canter, 1997a; Cooper and Canter, 1997b)

and little is known about the challenges and opportunities facing state governments. This study fills this information void by assessing the barriers to and potential for effective CIA policy implementation. In addition, this study provides a preliminary understanding of the reasons why CIA procedures have not been adopted in some state programs. The administrators of these programs are generally concerned about the associated costs and time constraint. Helping them better understand the real costs and time needed for conducting CIA may help reduce their concerns and encourage them to adopt CIA practices.

Clearly, integrating CIA efforts into state environmental review programs is easier said than done. In addition to examining the barriers to and potential for effective CIA from the state administrators' perspectives, more efforts are needed to better understand the attitudes of: (1) state environmental review program staff who draft factsheets, manuals, and guidelines for directing state efforts; (2) staff of state agencies and local units of government who make decisions about whether or not to grant discharge or development permits, or fund proposed projects; and (3) consultants hired to collect and analyze data and prepare the necessary environmental review documents to assist project proposers in their applications for state permits or funds. These individuals may have different perspectives about assessing cumulative impacts within the context of environmental review, which provides tremendous value to identifying opportunities for promoting effective CIA at the state level.

CHAPTER 5 CONCLUSION

Lessons Learned

Nationwide, environmental review has become a standard mechanism for assessing environmental impacts of proposed activities prior to their undertaking. At the federal level, the NEPA was adopted as a response to public demand for environmental protection in the 1960s, mandating federal agencies to take into account environmental consequences along with technical and economic factors when planning for projects, programs, or policies. Inspired by NEPA, many state governments also developed their own environmental review frameworks for evaluating nonfederal economic development projects proposed, permitted, or funded by state agencies and/or local units of government. There is little doubt that both federal and state policies and procedures have greatly contributed to the more informed environmental planning and decision making with respect to whether or not to pursue certain economic development activities or grant relevant permits or funds to a proposed project.

Despite the widespread use of environmental review, one area that seems to be insufficient is the assessment of cumulative environmental impacts. Most environmental reviews are conducted on a project-by-project basis with a primary focus on the impacts of individual activities. This practice ignores important cumulative environmental impacts that are often benign for an individual project assessed within its site and lifespan, but that may be substantial when assessed within the context of other relevant past, present, and future activities on a broader geographic scale. Insufficient assessment of cumulative impacts may result in inaccurate and incomplete understanding of the project's potential environmental impacts, and thus, compromises the utility of the environmental review process. Considerable efforts have been made at the federal level to promote the integration of CIA and project-specific environmental review. Researchers have examined CIA policies and procedures among federal agencies in an attempt to identify barriers to effective practices and improve the quality of CIA. Comparing to the rich literature on federal efforts, little is known about how cumulative environmental impacts have been analyzed and evaluated at the state level.

The objective of the research described in this report is to help better understand state environmental review and CIA processes as a mean to promote sound environmental planning and management. In particular, it characterizes state environmental review frameworks for assessing cumulative impacts, describes the landscape of state CIA policies and procedures, examines the practices among state programs, and discusses the challenges and opportunities facing state administrators to incorporate CIA into existing environmental review processes.

This research identified 37 states nationwide with some form of formal environmental review policies and procedures. These states were then categorized into two tiers according to the breadth and depths of their policies and procedures. Tier-one includes 16 states with comprehensive requirements modeled after the federal NEPA mandating environmental reviews for applicable state and local projects statewide. Tier-two includes 21 states having environmental review requirements that are only applicable to certain development activities, for certain ecologically-important natural resources or environmental features, or in certain geographic areas.

Comparing states across tiers, the general trend is that tier-two states are less inclusive and consistent than tier-one states with respect to their relevant thresholds for triggering mandatory review, requirements for preparing review documents, and procedures for public participation and judicial review. Comparing states within each tier, great variations exist among states with respect to project coverage, the types of review documents required, and specific procedures for conducting environmental review. Looking at the general trend across tiers and great variations within tiers in aggregate suggests that the two-tier categorization is generally useful for describing and characterizing state environmental review policies and procedures; however, to which tier a state belongs should not be the sole determinant of the effectiveness of the policies and procedures.

Based on this contemporary assessment of state environmental review frameworks, this research then focuses its attention on the assessment of cumulative environmental impacts within these frameworks. Nationwide, 50 active environmental review programs have been established across 37 states to oversee and/or implement state environmental review requirements. A majority of these programs require CIA as part of their review processes, and have adopted various scales, baselines, criteria, methods and coordination measures to facilitate the evaluation of potential cumulative impacts. Great variations were observed among these programs with respect to the level of specific procedural requirements and the extent to which these requirements have been implemented. Surprisingly, not all procedural requirements necessarily result in the actual practice of the procedures. In addition, a state program with comprehensive and consistent environmental review policies and procedures does not necessarily imply extensive CIA requirements and practices.

Building upon the understanding of state CIA policies and practices, this research further discusses the challenges and opportunities facing state programs to incorporate CIA into their environmental review procedures. The administrators of state programs generally recognized the importance of CIA and understood their legal responsibility for addressing the needs for CIA. However, they generally considered their CIA efforts ineffective. Similar concerns were identified among administrators about how to effectively evaluate cumulative impacts. These concerns generally focus on the inability of existing environmental review policy frameworks to favorably structure CIA implementation, and the technical difficulties associated with conducting CIA at the state level. Several ideas were also proposed for improving current practices. These ideas include developing explicit procedural guidelines for conducting CIA and increasing collaboration among various states with a focus on sharing information and technical resources.

Looking at the key findings of the report in aggregate, one is led to a depiction in which CIA is required by 29 state environmental review programs across the country and different measures have been taken to implement these requirements. The administrators of these programs, although support the concept of assessing cumulative impacts, are not certain about how to conduct assessments in an effective manner. They face similar challenges with respect to analyzing and evaluating cumulative impacts, and have taken or are considering taking different approaches for improving current practices. Yet, regardless of the nature and characteristics of their programs, they all feel unsuccessful and unaided about what to do to strengthen their programs' ability to assess cumulative impacts in an environmental review process.

Policy and Program Innovation within State Environmental Review Frameworks

The depiction described in the previous section leads to a question—what can be done to facilitate effective CIA practices and better inform environmental planning and decision making? To look for answers, one direction is to explore possible strategies for adapting existing environmental review procedures in order to better serve the needs for assessing cumulative impacts.

As previously discussed, one major CIA barrier identified by state program administrators is the inability of existing environmental review frameworks to favorably structure CIA implementation, particularly regarding the lack of explicit CIA procedures. This suggests that efforts are needed for developing explicit guidelines that provide step-by-step directions for predicting and evaluating potential cumulative impacts. In order to develop practical guidelines, it is important to take into account different users' interests, including businesses and industries that may be project proposers, government agencies responsible for overseeing state environmental review processes, and private consulting firms hired for preparing particular environmental review documents. The guidelines should focus on describing and explaining necessary procedures for effectively conducting CIA. For instance, it may discuss important issues that need to be considered in a CIA process based on the environmental and natural resource conditions in a state, identify possible sources for data collection, discuss appropriate scales and baselines for assessing cumulative impacts of different types of development activities, provide a list of available analytic methods for CIA and discuss the appropriate use of each method, provide measurable criteria for determine the significance of predicted cumulative impacts, and address how to report CIA findings in an environmental review document. Another idea is to establish state oversight of CIA-related activities and assign staff with knowledge and experience to be responsible for overseeing relevant practices so that responsible government agencies and project proposers know where to look for assistance when needed.

Another major concern among state program administrators relates to the technical difficulties in conducting CIA, particularly regarding the lack of data and information and insufficient technical expertise. One opportunity identified in the research is to increase collaboration among various state agencies with a focus on sharing information and technical resources. To conduct a CIA require considerable information and technical expertise. State agencies often focus on specific environmental issues and may not have access to data or technical expertise to fully assess cumulative impacts beyond their specialized areas. If various agencies can be involved, they may provide additional data and information, as well as technical support to the responsible agency for overseeing the preparation of CIA documents. Therefore, collaboration between the responsible agency and other state agencies may help all parties better understand the environmental conditions of proposed projects, improve their ability to predict and evaluate cumulative impacts, and overcome the technical difficulties such as lack of information and technical resources. One idea is to establish a statewide environmental database through interagency collaboration. It will require efforts to collect data describing the environmental conditions in a state, maintaining and updating the data periodically, and adopt mechanisms for sharing access to the database. Another idea is to develop a registry in which projects undertaken in the past and projects proposed or planned for the future are systematically recorded. This effort may help provide responsible government agencies and project proposers

with necessary data and information regarding relevant past and future actions for assessing cumulative environmental impacts.

Finally, this research suggests that strategies could be developed to promote CIA practices in state environmental review programs that have not adopted relevant procedures. As discussed in the report, the administrators without CIA experience generally recognized the potential value of CIA for improving their environmental review and decision making processes; however, they were concerned about the associated costs and time constraint. One potential opportunity is to assist programs in formulating CIA policies that provide reasonable mechanisms for sharing the assessment costs among project proposers and responsible government agencies or providing financial assistance to support them to prepare CIA documents. Another opportunity is to adjust existing legal and administrative timeframes for environmental decision making so that additional time will be provided to encourage the assessment of cumulative impacts. However, further research is needed to design a system that balances the needs for thorough assessments and for making efficient permitting and funding decisions.

It is worth noting that aforementioned ideas for facilitating CIA efforts may work better in some occasions than others. Because of the great diversity among state environmental review programs regarding the level of CIA policies and practices, one needs to accept that there is no panacea—either individual strategy or a set of strategies—that will improve CIA practices in all programs across the country. To promote good practices, efforts are needed on a program-by-program basis for tailoring technical and institutional assistance towards the need of individual programs.

Better Alternative for Assessing Cumulative Impacts?

Building upon the findings of the report, this research highlights a discrepancy between the nature of existing environmental review frameworks and the nature of CIA. The former is about evaluating the impacts of individual projects proposed by individual persons, private entities, public organizations, or government agencies. However, assessing cumulative impacts is about going beyond individual projects, examining other past, present and future activities, and trying to understand their collective impacts simultaneously. This suggests that it may be the nature of the existing environmental review frameworks that is limiting states' ability to assess cumulative impacts over time, across landscapes, and under multiple jurisdictions. Perhaps, environmental review is not the best instrument for assessing cumulative impacts. Thus, the key question to ask may not be how to improve current procedures, but whether environmental review is an effective mechanism for addressing the growing concerns about cumulative environmental consequences? And if not, what could be an alternative policy framework under which cumulative impacts can be more effectively assessed?

To answer these questions, one is led to an exploration beyond the scope of this report. A new research agenda is needed to explore alternative frameworks for assessing cumulative impacts and to compare the effectiveness of these potential alternatives using existing environmental review frameworks as the baseline. Several studies in the past discussed the idea of considering cumulative impacts within the context of regional planning (James et al., 1983; Contant and Wiggins, 1991; McCold and Saulsbury, 1996). Building upon this idea, future research may be needed to investigate the potential of utilizing the regional planning framework as an alternative

for CIA. It will be beneficial to gain a comprehensive understanding of existing regional planning policies and procedures in the US in order to identify the potential of using planning approach for assessing cumulative impacts.

It is important to keep in mind that exploring alternative policy frameworks for CIA does not undermine the value of environmental review. Environmental review will remain a useful mechanism for predicting, evaluating, and minimizing project-specific environmental impacts. In addition, regional planning or other alternative processes may contribute to identifying and mitigating cumulative environmental impacts from a long-term perspective. Different policy frameworks may complement each other and provide great value to inform better environmental decision making among government agencies, ranging from whether relevant permits should be issued to whether a particular region is capable of supporting continuous economic growth without damaging its environment. If regional planning is indeed a better framework for assessing cumulative impacts, further research may be needed to develop mechanisms for utilizing environmental review and planning frameworks jointly in order to facilitate sustainable environmental planning and management on a range of scales from local through state to national and even global.

Finally, it will be beneficial to conduct a review of CIA policy frameworks adopted outside of the US. Such review will provide new perspectives on the technical and institutional options that may assist CIA efforts domestically. It will also help facilitate communication among environmental planning professionals across countries, which may greatly contribute to environmental planning efforts worldwide.

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Table 1. Two-tier categorization of states for characterizing state environmental review policies and procedures.

<p><i>Tier-one: States with comprehensive and consistent environmental review procedures</i></p> <p><u>16 states:</u> California, Connecticut, Georgia, Hawaii, Indiana, Maryland, Massachusetts, Minnesota, Montana, New Jersey, New York, North Carolina, South Dakota, Virginia, Washington, Wisconsin</p> <p><i>Tier-two: States with environmental review procedures applicable to specific development activities, for certain natural resources or environmental conditions, or in certain geographic areas</i></p> <p><u>21 states:</u> Alaska, Arkansas, Delaware, Florida, Illinois, Kansas, Kentucky, Louisiana, Maine, Michigan, Mississippi, Missouri, Nebraska, Nevada, New Mexico, Oregon, Pennsylvania, Rhode Island, Texas, Utah, Vermont</p> <p>Attributes described for tier-one and tier-two states:</p> <ul style="list-style-type: none"> • Statutes and administrative rules that require environmental review • Responsible entities (environmental review programs) for overseeing and/or implementing state environmental review policies • Types of projects that are subject to review • Levels of review (including information on the types of documents required and description of each type of documents) • Threshold for requiring the preparation of an environmental review document • Criteria for determining the significance of potential environmental impacts • Requirements for public participation in an environmental review process • Judicial review of an environmental review process <p><i>Note: States with no formal environmental review requirements</i></p> <p><u>13 states:</u> Alabama, Arizona, Colorado, Idaho, Iowa, New Hampshire, North Dakota, Ohio, Oklahoma, South Carolina, Tennessee, West Virginia, Wyoming</p>

Table 2. Statutes, administrative rules, and executive order for requiring state-level environmental review by state, 2007.

TIER-ONE STATES

California:

- Public Resources Code, Sections 21000 through 21177 The California Environmental Quality Act
- California Code of Regulations, Title 14, Sections 15000 through 15387 Guidelines for Implementation of the California Environmental Quality Act

Connecticut:

- Connecticut General Statutes, Sections 22a-1a through 22a-1h The Connecticut Environmental Policy Act
- Regulations of Connecticut State Agencies, Sections 22a-1a-1 through 22a-1a-12 CEPA Regulations

Georgia:

- Official Code of Georgia Annotated, Title 12, Chapter 16, Article 1 Environmental Policy

Hawaii:

- Hawaii Revised Statutes, Chapter 343 Environmental Impact Statements
- Hawaii Administrative Rules, Chapter 11-200 Environmental Impact Statement Rules

Indiana:

- Indiana Code, Title 13, Article 12, Chapter 4 Environmental Impact Statements
- Indiana Administrative Code, Title 326 Air Pollution Control Board, Article 16 State Environmental Policy
- Indiana Administrative Code, Title 327 Water Pollution Control Board, Article 11 State Environmental Policy
- Indiana Administrative Code, Title 329 Solid Waste Management Board, Article 5 State Environmental Policy

Maryland:

- Annotated Code of Maryland, Natural Resources Article, Title 1 Department of Natural Resources, Subtitle 3 Maryland Environmental Policy Act
- Maryland Environmental Policy Act Revised Guidelines, issued by the Secretary of Natural Resources in 1974*
- Code of Maryland Regulations, Title 09 Department of Labor, Licensing, and Regulation, Subtitle 01 Office of the Secretary, Chapter 01 Implementation of the Maryland Environmental Policy Act
- Code of Maryland Regulations, Title 11 Department of Transportation, Subtitle 01 Office of the Secretary, Chapter 08 Implementation of the Maryland Environmental Policy Act
- Code of Maryland Regulations, Title 14 Independent Agencies, Subtitle 24 Office of Planning, Chapter 01 Guidelines for Implementation of the Maryland Environmental Policy Act
- Code of Maryland Regulations, Title 17 Department of Budget and Management, Subtitle 03 Capital Budget, Chapter 01 Capital Division

Massachusetts:

- The General Laws of Massachusetts, Chapter 30, Sections 61 through 62H Environmental impact of projects, etc. conducted by agencies
- Code of Massachusetts Regulations, Title 301, Section 11 MEPA Regulations

Minnesota:

- Minnesota Statutes, Sections 116D.04 Environmental Impact Statements
- Minnesota Rules, Chapter 4410, Parts 4410.0200 through 4410.6500 Minnesota Environmental Review Program Rules

Montana:

- Montana Code Annotated, Title 75, Chapter 1, Parts 1 through 3 Montana Environmental Policy Act
- Administrative Rules of Montana, Sections 17.4.601 through 17.4.636 Montana Environmental Policy Act

New Jersey:

- Executive Order No. 215 of 1989, Environmental Assessment

New York:

- Environmental Conservation Law, Article 8 Environmental Quality Review
- New York Codes, Rules and Regulations, Title 6 Department of Environmental Conservation, Chapter VI General Regulations, Part 617 State Environmental Quality Review

North Carolina:

- General Statutes, Chapter 113A, Article I Environmental Policy Act
- North Carolina Administrative Code, Title 01 Administration, Chapter 25 Environmental Policy Act

South Dakota:

- South Dakota Codified Laws, Chapter 34A-9 Environmental Impact of Governmental Actions

Virginia:

- Code of Virginia, Sections 10.1-1188 through 10.1-1192
- Procedure for Environmental Impact Review of Major State Facilities, issued by the Virginia Department of Environmental Quality in 2005*

Washington:

- Revised Code of Washington, Title 43, Chapter 43.21C State Environmental Policy
- Washington Administrative Code, Title 197, Chapter 197-11 SEPA Rules

Wisconsin:

- Wisconsin Statutes, Section 1.11 Governmental Consideration of Environmental Impact
- Wisconsin Administrative Code, Chapter 60 Wisconsin Environmental Policy Act, Procedures for Department Actions
- Wisconsin Administrative Code, Chapter 3 Environmental Impact Statements and Assessments
- Wisconsin Administrative Code, Chapter 1 Environmental Analysis and Review Procedures for Department Actions
- Wisconsin Administrative Code, Chapter 335 Environmental Policy Implementation
- Wisconsin Administrative Code, Chapter 18 Environmental Policy Implementation
- Wisconsin Administrative Code, Chapter 150 Environmental Analysis and Review Procedures for Department Actions
- Wisconsin Administrative Code, Chapter 4 Environmental Analysis
- Wisconsin Administrative Code, Chapter 12 Wisconsin Environmental Policy Act Procedures
- Wisconsin Administrative Code, Chapter 400 Wisconsin Environmental Policy Act Procedures for Department Actions

TIER-TWO STATES

Alaska:

- Alaska Statutes, Section 16.05 Fish and Game Code
- Alaska Statutes, Chapter 46.40 The Alaska Coastal Management Program
- Alaska Statutes, Section 27.21 Alaska Surface Coal Mining Control and Reclamation Act
- Alaska Administrative Code, Title 11 Natural Resources, Part 2 Parks, Recreation, and Public Use, Chapter 15 Trails and Footpaths Grant Program, Section 15.030 Application

Arkansas:

- Arkansas Code, Section 8-6-715 Regional Solid Waste Management Districts and Boards - Eminent Domain

- Arkansas Code, Section 15-41-108 Cutting Timber on Commission Land - Environmental Impact Statement
- Arkansas Code, Section 20-21-222 Ionizing Radiation - Administrative Proceedings
- Arkansas Code, Section 23-18-501 Utility Facility Environmental and Economic Protection Act
- Arkansas Public Service Commission Rules of Practice and Procedures, Section 7.08 Certificates of Environmental Compatibility and Public Need - Major Utility Facilities

Delaware:

- Delaware Code, Title 7, Chapter 70 Regulations Governing Delaware's Coastal Zone
- Delaware Code, Title 17, Chapter 17 Delaware-New Jersey Compact, Subchapter II Effectuation; Commissioners

Florida:

- Florida Statutes, Chapter 373, Part IV Management and Storage of Surface Waters
- Florida Statutes, Chapter 380, Part I Environmental Land and Water Management, Section 380.051 Coordinated agency review; Florida Keys area
- Florida Administrative Code, Chapter 18-20 Florida Aquatic Preserves
- Florida Administrative Code, Chapter 68E-9 The Florida Artificial Reef Program

Illinois:

- Illinois Compiled Statutes, Chapter 225, Part 725 Illinois Oil and Gas Act (225 ILCS 725)
- Illinois Administrative Code, Title 17 Conservation, Part 1075 Consultation Procedures for Assessing Impacts of Agency Actions on Endangered and Threatened Species and Natural Areas
- Illinois Administrative Code, Title 17 Conservation, Part 3010 Illinois Snowmobile Grant Program
- Illinois Administrative Code, Title 17 Conservation, Part 3020 Snowmobile Trail Establishment Fund Grant Program
- Illinois Administrative Code, Title 17 Conservation, Part 3025 Open Space Lands Acquisition and Development Grant Program
- Illinois Administrative Code, Title 17 Conservation, Part 3040 Illinois Bicycle Path Grant Program
- Illinois Administrative Code, Title 17 Conservation, Part 3045 Off-Highway Vehicle Recreational Trails Grant Program
- Illinois Administrative Code, Title 17 Conservation, Part 3050 Open Land Trust Grant Program
- Illinois Administrative Code, Title 32 Energy, Part 601 Licensing Requirements for Land Disposal of Radioactive Waste
- Illinois Administrative Code, Title 35 Environmental Protection, Part 102 Regulatory and Informational Hearings and Proceedings, Subpart B Regulations of General Applicability, Resource Conservation and Recovery Act (RCRA) Amendments, and Site-specific Regulations
- Illinois Administrative Code, Title 35 Environmental Protection, Part 104 Regulatory Relief Mechanisms
- Illinois Administrative Code, Title 35 Environmental Protection, Part 180 Procedures and Criteria for Reviewing Applications for Provisional Variances
- Illinois Administrative Code, Title 35 Environmental Protection, Part 367 Procedures for Issuing Financial Assistance Awards under the Illinois Clean Lakes Program
- Illinois Administrative Code, Title 35 Environmental Protection, Part 617 Regulated Recharge Areas
- Illinois Administrative Code, Title 35 Environmental Protection, Part 750 Illinois Hazardous Substances Pollution Contingency Plan
- Illinois Administrative Code, Title 35 Environmental Protection, Part 870 Procedures for Issuing Municipal Waste Planning and Nonhazardous Solid Waste or Municipal Waste Enforcement Grants
- Illinois Administrative Code, Title 47 Housing and Community Development, Part 365 Affordable Housing Bond Program
- Illinois Administrative Code, Title 47 Housing and Community Development, Part 360

Affordable Housing Program

Kansas:

- Kansas Statutes Annotated, Chapter 82a Waters and Watercourses, Article 3 Obstructions in Streams, Section 327 Same; Review of Proposed Project; Considerations
- Kansas Statutes Annotated, Chapter 65 Public Health, Article 34 Solid And Hazardous Waste, Sections 161 through 174 Voluntary Cleanup and Property

Kentucky:

- Kentucky Revised Statutes, Chapter 211 State Health Programs, Section 852 Prerequisites to approval of nuclear waste disposal facility - Procedures - Exception
- Kentucky Revised Statutes, Chapter 224 Environmental Protection, Subchapter 10 Environmental and Public Protection Cabinet, Section 280 Cumulative environmental assessment and fee required before construction of facility for generating electricity - Conditions imposed by cabinet - Administrative regulations
- Kentucky Administrative Regulations, Title 401 Natural Resources and Environmental Protection Cabinet Department for Environmental Protection, Chapter 4 Water Resources, Section 125 Wild rivers administration
- Kentucky Administrative Regulations, Title 401 Natural Resources and Environmental Protection Cabinet Department for Environmental Protection, Chapter 5 Water Quality, Section 6 Wastewater planning requirements for regional areas

Louisiana:

- Louisiana Revised Statutes, Title 30, Section 2018 Environmental Assessment Hearings
- Louisiana Administrative Code, Title 33 Environmental Quality, Part VII Solid Waste, Section 523 Part III: Additional Supplementary Information
- Louisiana Administrative Code, Title 33 Environmental Quality, Part IX Water Quality, Section 303 Permit Application Information

Maine:

- Maine Revised Statutes, Title 38 Waters and Navigation, Section 480-X Alterations of freshwater wetlands
- Code of Maine Rules, 06 096 Department of Environmental Protection/General, Chapter 310 Wetlands and Waterbodies Protection

Michigan:

- Michigan Compiled Laws, Sections 324.11101 through 324.11153 Hazardous Waste Management
- Michigan Compiled Laws, Sections 324.30301 through 324.30323 Wetlands Protection
- Michigan Compiled Laws, Sections 324.35301 through 324.35326 Sand Dunes Protection and Management
- Michigan Compiled Laws, Sections 324.63201 through 324.63223 Nonferrous Metallic Mineral Mining
- Michigan Compiled Laws, Sections 324.63514 through 324.63526 Surface and Underground Coal Mine Reclamation - Permits
- Michigan Compiled Laws, Sections 324.63701 through 324.63714 Sand Due Mining
- Michigan Administrative Code, Sections R 425.101 through R 425.602 Nonferrous Metallic Mineral Mining
- Michigan Administrative Code, Sections 281.921 through R 281.925 Wetlands Protection
- Michigan Administrative Code, Sections 299.9501 through R 299.9525 Construction Permits and Operation Licenses

Mississippi:

- Mississippi Code, Title 49 Conservation and Ecology, Chapter 27 Coastal Wetlands Protection Act

Missouri:

- Code of State Regulations, Title 1 Office of Administration, Division 30 Division of Facilities Management, Design and Construction, Chapter 2 Capital Improvement and Maintenance Budget

Nebraska:

- Nebraska Revised Statutes, Sections 71-3501 through 71-3506 Radiation Control Act
- Nebraska Revised Statutes, Sections 81-1578 through 81-15116 Low-level Radioactive Waste Disposal Act

Nevada:

- Nevada Revised Statutes, Sections 277.190 through 277.220 Tahoe Regional Planning Compact
- Tahoe Regional Planning Agency Code of Ordinances
- Tahoe Regional Planning Agency Rules of Procedure

New Mexico:

- New Mexico Statutes Annotated, Chapter 69 Mines, Article 36 New Mexico Mining Act
- New Mexico Statutes Annotated, Chapter 69 Mines, Article 25A Surface Mining Act

Oregon:

- Oregon Revised Statutes, Chapter 470 Small Scale Local Energy Projects
- Oregon Revised Statutes, Chapter 517 Mining and Mining Claims
- Oregon Revised Statutes, Chapter 540 Distribution of Water; Watermasters; Change in Use, Transfer or Forfeiture of Water Rights
- Oregon Revised Statutes, Chapter 543 Hydroelectric Projects and Use of Water for Hydroelectric Power and Standards for Hydroelectric Applications
- Oregon Administrative Rules, Chapter 141 Department of State Lands, Division 67 Rules Governing the Sale, Exchange and Purchase of Land
- Oregon Administrative Rules, Chapter 141 Department of State Lands, Division 70 Leasing of Onshore State-owned Oil and Gas Rights
- Oregon Administrative Rules, Chapter 250 Oregon State Marine Board, Division 14 Marine Facility Program Rules
- Oregon Administrative Rules, Chapter 345 Department of Energy, Energy Facility Siting Council, Division 20 Notice of Intent
- Oregon Administrative Rules, Chapter 632 Department of Geology and Mineral Industries, Division 37 Chemical Process Mining
- Oregon Administrative Rules, Chapter 690 Water Resources Department, Division 51 Appropriation
- Oregon Administrative Rules, Chapter 690 Water Resources Department, Division 52 Decommissioning Rules for Non-FERC Projects
- Oregon Administrative Rules, Chapter 690 Water Resources Department, Division 90 Water Development Loan Fund
- Oregon Administrative Rules, Chapter 690 Water Resources Department, Division 100 Payment for Public Benefits in Water Projects
- Oregon Administrative Rules, Chapter 690 Water Resources Department, Division 380 Water Right Transfers

Pennsylvania:

- Pennsylvania Code, Title 25 Environmental Protection, Chapter 236 Low-level Radioactive Waste Management and Disposal
- Pennsylvania Code, Title 25 Environmental Protection, Chapter 245 Administration of the Storage Tank and Spill Prevention Program
- Pennsylvania Code, Title 25 Environmental Protection, Chapter 105 Dam Safety and Waterway Management
- Pennsylvania Code, Title 25 Environmental Protection, Chapter 269, Subchapter A Siting Hazardous Waste Treatment and Disposal Facilities

- Pennsylvania Code, Title 25 Environmental Protection, Chapter 271 Municipal Waste Management - General Provisions
- Pennsylvania Code, Title 25 Environmental Protection, Chapter 287 Residual Waste Management - General Provisions
- Pennsylvania Code, Title 7 Agriculture, Chapter 130d Application of Soil and Groundwater Contaminated with Agricultural Chemicals to Agricultural Lands

Rhode Island:

- State of Rhode Island General Laws, Title 23 Health and Safety, Chapter 23-18.9 Refuse Disposal
- State of Rhode Island General Laws, Title 23 Health and Safety, Chapter 23-63 Vehicle Tire Storage and Recycling
- Rhode Island Water Facilities Program Administrative Procedure, issued by the Rhode Island Water Resources Board in 1989*

Texas:

- Texas Statutes, Water Code, Section 61.116 Lease of State Owned Lands and Flats
- Texas Statutes, Transportation Code, Chapter 91 Rail Facilities, Subchapter B Acquisition and Development of Rail Facilities
- Texas Statutes, Transportation Code, Chapter 201 General Provisions and Administration, Subchapter H Plans and Projects
- Texas Statutes, Transportation Code, Chapter 370 Regional Mobility Authorities, Subchapter E Acquisition, Construction, and Operation of Transportation Projects
- Texas Statutes, Health and Safety Code, Chapter 361 Solid Waste Disposal Act, Subchapter X County Programs for Cleanup and Economic Redevelopment of Brownfields
- Texas Statutes, Health and Safety Code, Chapter 361 Solid Waste Disposal Act, Subchapter S Voluntary Cleanup Program
- Texas Statutes, Natural Resources Code, Chapter 91 Provisions Generally Applicable, Subchapter O Railroad Commission Voluntary Cleanup Program

Utah:

- Utah Code, Title 19 Environmental Quality Code, Chapter 08 Voluntary Cleanup Program
- Utah Code, Title 40 Mines and Mining, Chapter 10 Coal Mining and Reclamation

Vermont:

- Vermont Statutes, Title 10 Conservation and Development, Chapter 151 State Land Use and Development Plans (Act 250)

*The guidelines and procedures issued serve as administrative rules for implementing relevant environmental review statutes, however they do not have legal authority.

Table 3. Environmental review policy and program attributes of tier-one states.

		CA	CT	GA	HI	IN	MA	MD	MN	MT	NC	NJ	NY	SD	VA	WA	WI	Total	
<i>Legal and administrative requirements and measures</i>																			
Policy objectives		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	16
Administrative rules		✓	✓		✓	✓	✓		✓	✓	✓		✓			✓	✓		11
Factsheets, manuals, handbooks, guidelines		✓	✓		✓		✓	✓	✓	✓	✓		✓		✓	✓	✓		12
Responsible entity for overseeing state environmental review efforts		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			15
<i>Projects subject to review</i>																			
State actions		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	16
Local actions		✓		✓	✓				✓		✓	✓	✓			✓			8
Private actions requiring state or local permits or funds		✓	✓		✓		✓		✓	✓			✓	✓		✓	✓		10
<i>The types of reviews required and the determination of environmental significance</i>																			
The types of reviews required	EA or an equivalent	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓		13
	EIS or an equivalent	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	16
EA mandatory thresholds			✓		✓		✓		✓			✓	✓					✓	7
EIS mandatory thresholds		✓	✓				✓		✓			✓						✓	6
Criteria for determining the environmental significance		✓	✓		✓				✓	✓			✓			✓	✓		8
<i>Procedures for public participation</i>																			
		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓		✓	✓		14
<i>Mechanisms for judicial review</i>																			
		✓		✓	✓		✓		✓	✓	✓		✓			✓			9

Table 4. Requirements for assessing cumulative impacts in state environmental review process.

	Overall requirements	Definition of cumulative impacts	Geographic scale requirements	Time scale requirements	Baseline requirements	Formal significance criteria	Intergovernmental coordination requirements
<i>Programs in Tier-one states</i>							
Connecticut	✓	✓				✓	✓
Hawaii	✓	✓		✓		✓	✓
Indiana	✓						
Massachusetts	✓		✓		✓		
Maryland	✓		✓	✓			
Minnesota	✓	✓	✓	✓			✓
Montana	✓	✓		✓	✓	✓	✓
North Carolina	✓	✓	✓	✓		✓	
New Jersey	✓			✓	✓		✓
New York	✓					✓	✓
South Dakota	✓					✓	
Virginia	✓	✓					
Washington	✓		✓	✓	✓		✓
Wisconsin	✓		✓	✓	✓		✓
Total	14	6	6	8	5	6	8
<i>Programs in tier-two states</i>							
Delaware	✓	✓					
Florida 1	✓	✓	✓		✓		✓
Florida 2	✓						
Illinois	✓		✓	✓	✓	✓	✓

Continue to the next page

	Overall requirements	Definition of cumulative impacts	Geographic scale requirements	Time scale requirements	Baseline requirements	Formal significance criteria	Intergovernmental coordination requirements
<i>Programs in tier-two states (continued...)</i>							
Kentucky	✓	✓	✓				✓
Maine	✓						
Michigan 1	✓	✓	✓	✓	✓	✓	✓
Michigan 2	✓	✓	✓	✓	✓	✓	✓
Michigan 3	✓		✓	✓	✓	✓	✓
Mississippi	✓		✓				✓
New Mexico	✓		✓	✓	✓	✓	✓
Pennsylvania	✓		✓	✓	✓	✓	✓
Texas	✓	✓	✓	✓	✓		
Utah	✓	✓		✓	✓	✓	✓
Vermont	✓	✓	✓	✓	✓	✓	
Total	15	8	11	9	10	8	10
Grand Total	29	14	17	17	15	14	18

Table 5. Natural resource issues addressed within a CIA context.

	The number of programs that ...					
	assessed cumulative impacts regarding the issue of ... over the past 10 years in ...		assessed cumulative impacts regarding the issue of ... in less than <u>50%</u> of environmental review documents prepared over the past 10 years in ...		considered assessing cumulative impacts regarding the issue of ... <u>moderately difficult or very difficult</u> in ...	
	tier-one states	tier-two states	tier-one states	tier-two states	tier-one states	tier-two states
Soil erosion and sedimentation	11	10	10	6	7	6
Ground or surface water quality	12	11	11	5	6	7
Ground or surface water quantity	12	10	11	7	7	7
Wetlands	12	9	10	5	4	7
Air quality	11	5	10	3	5	3
Forest resources	10	6	9	5	6	2
Wildlife habitat	11	10	10	5	6	6
Land development and conversion	12	8	10	5	7	6
Recreational resources	10	7	10	5	4	3
Fisheries	10	9	10	5	7	5
Mineral mining	10	4	8	3	7	2
Nonmetallic mining	10	4	10	3	6	2

Table 6. Requirements for and practices of using geographic scales in a CIA process.

	require the use of geographic scales	Programs that ... have implemented the geographic scale requirements	have voluntarily adopted geographic scales
<i>Programs in tier-one states</i>			
Connecticut			✓
Hawaii			
Indiana			
Massachusetts	✓	✓	
Maryland	✓	✓	
Minnesota	✓	✓	
Montana			✓
North Carolina	✓		
New Jersey			✓
New York			✓
South Dakota			
Virginia			
Washington	✓	✓	
Wisconsin	✓	✓	
Total	6	5	4
<i>Programs in tier-two states</i>			
Delaware			✓
Florida 1	✓	✓	
Florida 2			
Illinois	✓	✓	
Kentucky	✓	✓	
Maine			
Michigan 1	✓	✓	
Michigan 2	✓	✓	
Michigan 3	✓	✓	
Mississippi	✓	✓	
New Mexico	✓	✓	
Pennsylvania	✓	✓	
Texas	✓	✓	
Utah			
Vermont	✓	✓	
Total	11	11	1
Grand Total	17	16	5

Table 7. Requirements for and practices of using time scales in a CIA process.

	require using time scales	Programs that ...			
		have implemented the requirements by considering ...		have voluntarily adopted time scales by considering ...	
		past actions	future actions	past actions	future actions
<i>Programs in tier-one states</i>					
Connecticut				✓	✓
Hawaii	✓				
Indiana					
Massachusetts				✓	✓
Maryland	✓	✓	✓		
Minnesota	✓	✓	✓		
Montana	✓	✓	✓		
North Carolina	✓	✓			
New Jersey	✓	✓	✓		
New York					✓
South Dakota					
Virginia					
Washington	✓	✓	✓		
Wisconsin	✓		✓		
Total	8	6	6	2	3
<i>Programs in tier-two states</i>					
Delaware					✓
Florida 1				✓	✓
Florida 2				✓	
Illinois	✓	✓	✓		
Kentucky				✓	✓
Maine					
Michigan 1	✓	✓	✓		
Michigan 2	✓				
Michigan 3	✓	✓			
Mississippi				✓	✓
New Mexico	✓		✓		
Pennsylvania	✓		✓		
Texas	✓	✓	✓		
Utah	✓	✓	✓		
Vermont	✓	✓			
Total	9	6	6	4	4
Grand Total	17	12	12	6	7

Table 8. Requirements for and practices of using baselines in a CIA process.

	require using baselines	Programs that ...		have voluntarily adopted baselines by using ...	
		have implemented the requirements by using the ... current condition	future condition	current condition	future condition
<i>Programs in tier-one states</i>					
Connecticut				✓	✓
Hawaii					
Indiana					
Massachusetts	✓	✓	✓		
Maryland					
Minnesota					
Montana	✓	✓	✓		
North Carolina				✓	✓
New Jersey	✓	✓	✓		
New York				✓	✓
South Dakota				✓	✓
Virginia					
Washington	✓	✓	✓		
Wisconsin	✓	✓	✓		
Total	5	5	5	4	4
<i>Programs in tier-two states</i>					
Delaware					
Florida 1	✓	✓			
Florida 2				✓	✓
Illinois	✓	✓	✓		
Kentucky					
Maine					
Michigan 1	✓				
Michigan 2	✓				
Michigan 3	✓	✓	✓		
Mississippi					
New Mexico	✓	✓			
Pennsylvania	✓				
Texas	✓	✓	✓		
Utah	✓		✓		
Vermont	✓	✓	✓		
Total	10	6	5	1	1
Grand Total	15	11	10	5	5

Table 9. Requirements for and practices of intergovernmental coordination in a CIA process.

	intergovernmental coordination is required for CIA	Programs where... coordination has occurred ...		
		among state agencies	between state and federal agencies	between state and local agencies
<i>Programs in tier-one states</i>				
Connecticut	✓	✓	✓	✓
Hawaii	✓	✓	✓	✓
Indiana				
Massachusetts		✓	✓	✓
Maryland		✓	✓	
Minnesota	✓	✓	✓	✓
Montana	✓	✓	✓	✓
North Carolina		✓	✓	✓
New Jersey	✓	✓	✓	✓
New York	✓	✓	✓	✓
South Dakota		✓	✓	✓
Virginia		✓	✓	✓
Washington	✓	✓	✓	✓
Wisconsin	✓	✓	✓	✓
Total	8	13	13	12
<i>Programs in tier-two states</i>				
Delaware		✓	✓	✓
Florida 1	✓	✓	✓	✓
Florida 2		✓	✓	✓
Illinois	✓	✓	✓	✓
Kentucky	✓	✓	✓	✓
Maine				
Michigan 1	✓	✓	✓	✓
Michigan 2	✓	✓	✓	✓
Michigan 3	✓	✓	✓	✓
Mississippi	✓	✓	✓	✓
New Mexico	✓	✓	✓	✓
Pennsylvania	✓	✓	✓	✓
Texas		✓	✓	✓
Utah		✓	✓	✓
Vermont	✓	✓	✓	✓
Total	10	14	14	14
Grand Total	18	27	27	26

Table 10. Average ratings of state program administrator perceptions of barriers to effective CIA policy implementation.

	Programs in tier-one states	Programs in tier-two states	All programs
<i>Potential barriers related to the tractability of the CIA issue</i>			
Ambiguous legal requirements for CIA	2.93	2.54	2.74
<i>Potential barriers related to the ability of a CIA policy to favorably structure its implementation</i>			
Ambiguous definition of cumulative impacts	3.21	2.69	2.96
Lack of explicit procedures for CIA	3.50	2.38	2.96
Lack of significance criteria for determining unacceptable cumulative impacts	3.08	2.31	2.69
Lack of alternative forms of environmental review for CIA (other than standard environmental assessments or environmental impact statements)	2.69	2.00	2.35
Lack of adequate staffing			
Limited legal timeframe for CIA in an environmental review process	2.31	2.31	2.31
<i>Potential barriers related to technical difficulties</i>			
Poor understanding of appropriate geographic scales for CIA among project proposers and responsible state agencies	2.77	2.00	2.38
Poor understanding of appropriate time scales for CIA among project proposers and responsible state agencies	2.69	1.77	2.23
Poor understanding of appropriate baseline conditions for CIA among project proposers and responsible state agencies	2.85	2.00	2.42
Lack of technical expertise for CIA	2.77	2.38	2.58
Lack of practical methods for CIA	3.25	2.38	2.80
Lack of data and information needed to assess cumulative impacts	3.15	2.62	2.88
Limited access to data and information	2.75	2.31	2.52
<i>Potential barriers related to institutional factors</i>			
Insufficient coordination among local, state, and federal agencies	2.46	1.85	2.15
Lack of recognition of the importance of CIA among environmental review staff	2.29	2.00	2.15
Businesses and industries generally do not support CIA	2.85	1.92	2.38
Lack of general public support for CIA	2.25	2.00	2.12

Note: Each barrier was rated by survey respondents on a scale of 1 to 4 (1 = not a barrier, 2 = a minimal barrier, 3 = a moderate barrier, 4 = a significant barrier). Numbers in this table represent the average ratings given by state program administrators to the potential barriers listed in the survey questionnaire.

Table 11. Logit estimates of the empirical model for predicting perceived barriers.

Variables	Coefficient [standard error] (z-statistic)		
	AMBDEF	LACPRO	LACDAT
TIER	93.53 [.] (.)	2.70 [1.51] (1.78)	1.11 [1.16] (0.96)
REQGEO	74.74*** [1.66] (45.07)	2.91 [1.83] (1.59)	0.43 [1.39] (0.31)
REQTIME	-56.06 [.] (.)	1.32 [2.02] (0.65)	0.32 [1.44] (0.22)
REQBASE	-0.60 [.] (.)	-3.71 [2.40] (-1.55)	0.23 [1.36] (0.17)
FORCRI	36.40 [.] (.)	-0.28 [1.39] (-0.20)	-2.10 [1.43] (-1.47)
REQCOOR	-55.18 [.] (.)	0.29 [1.33] (0.22)	2.04 [1.31] (1.57)
Constant	-1.53e-16 [1.41] (-0.00)	-0.82 [1.38] (-0.60)	-0.82 [1.41.] (-0.59)
No. of observations	25	25	24

* significant at 10%; ** significant at 5%; *** significant at 1%

Note:

AMBDEF represents the perceived barrier of ambiguous definition of cumulative impacts.

LACPRO represents the perceived barrier of lack of CIA procedures.

LACDAT represents the perceived barrier of lack of data for CIA.

TIER represents whether an environmental review program is from a tier-one or tier-two state. REQGEO represents whether or not a program requires the use of specific geographic scales. REQTIME represents whether or not a program requires the use of specific time scales.

REQBASE represents whether or not a program has adopted requirement for defining baseline. FORCRI represents whether or not a program has established formal significance criteria.

REQCOOR represents whether or not a program requires intergovernmental coordination.

Table 12. Average ratings of state program administrator perceptions of opportunities for improving CIA policy implementation.

	Programs in tier-one states	Programs in tier-two states	All programs
Provide more explicit requirements for CIA through state statutes and administrative rules	3.00	2.23	2.63
Provide more explicit guidance for CIA by adopting practical guidelines	3.21	2.85	3.04
Business and industry gain a better appreciation of the importance of CIA	2.25	2.85	2.56
Other state agencies in addition to the responsible agency for environmental review become more involved in a CIA process.	2.79	2.62	2.70
Federal agencies become more involved in CIA processes.	2.43	2.46	2.44
Local government units become more involved in CIA processes.	2.69	2.54	2.62
Public comments on proposed projects are explicitly related to cumulative impacts.	2.77	2.38	2.58
Judicial system provides more explicit guidance on when to assess cumulative impacts	2.38	2.15	2.27
Judicial system provides more explicit guidance on the standards for analyzing cumulative impacts and preparing CIAs	2.23	2.62	2.42
Judicial system provides more explicit guidance on how to determine the significance of a proposed project's cumulative impacts	2.23	2.54	2.38

Note:

Each potential idea for improving CIA policy implementation was rated by survey respondents on a scale of 1 to 4 (1 = not useful, 2 = minimally useful, 3 = moderately useful, 4 = very useful). Numbers in this table represent the average ratings given by state program administrators to the potential ideas listed in the survey questionnaire.

Table 13. Logit estimates of the empirical model for predicting perceived opportunities.

Variables	Coefficient [standard error] (z-statistic)		
	EXPGUI	STAINV	EXPREQ
TIER	37.02*** [1.46] (25.32)	-0.63 [1.62] (-0.39)	67.81 [8142.344] (0.99)
REQGEO	38.50 [.] (.)	0.43 [1.72] (0.25)	118.68 [13459.42] (0.99)
REQTIME	-19.95*** [1.68] (-11.86)	4.44* [2.48] (1.79)	51.30 [8235.938] (0.99)
REQBASE	18.20 [.] (.)	-2.42 [1.81] (-1.34)	-119.58 [13182.37] (0.99)
FORCRI	1.61 [1.73] (0.93)	-2.73 [1.78] (-1.53)	50.28 [6760.02] (0.99)
REQCOOR	-0.25 [1.74] (-0.14)	-3.27* [1.82] (-1.80)	-16.43 [3703.367] (0.99)
Constant	-36.59*** [1.80] (-20.31)	2.40 [2.03] (1.18)	-84.24 [10353.49] (0.99)
No. of observations	25	25	25

* significant at 10%; ** significant at 5%; *** significant at 1%

Note:

EXPGUI represents the perceived opportunity of adopting more explicit CIA guidelines.

STAINV represents the perceived opportunity of increasing collaboration among state agencies.

EXPREQ represents the perceived opportunity of adopting more explicit CIA requirements.

TIER, represents whether an environmental review program is from a tier-one or tier-two state. REQGEO represents whether or not a program requires the use of specific geographic scales. REQTIME represents whether or not a program requires the use of specific time scales.

REQBASE represents whether or not a program has adopted requirement for defining baseline. FORCRI represents whether or not a program has established formal significance criteria.

REQCOOR represents whether or not a program requires intergovernmental coordination.

Table 14. Average ratings of additional concerns about incorporating CIA practices into state environmental review procedures.

	States with CIA procedures	State without CIA procedures
Assessing cumulative impacts <i>has enhanced /would enhance</i> my state’s ability to fully identify the environmental impacts of a proposed project.	3.28	3.43
Assessing cumulative impacts <i>has improved/ would improve</i> my state’s permitting and financial assistance decisions.	3.28	3.43
CIA <i>has been/would be</i> a financial burden to businesses and industries in my state.	2.37	2.86
CIA <i>has been/would be</i> a financial burden to state agencies in my state.	2.54	3.14
CIA <i>has been/would be</i> a financial burden to local government units in my state	2.41	2.86
CIA <i>has slowed down/would slow down</i> the environmental review processes of proposed projects in my state.	2.67	3.29

Note:

Each statement was rated by survey respondents on a scale of 1 to 4 (1 = strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree). Numbers in this table represent the average ratings given by state program administrators to the listed statements

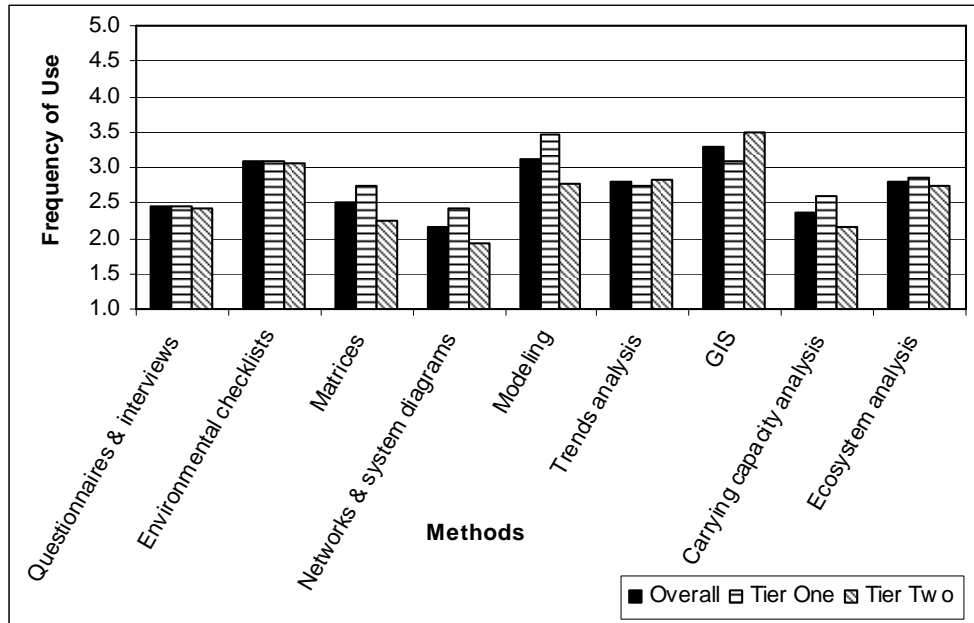


Figure 1. Data gathering and analytic methods for CIA.

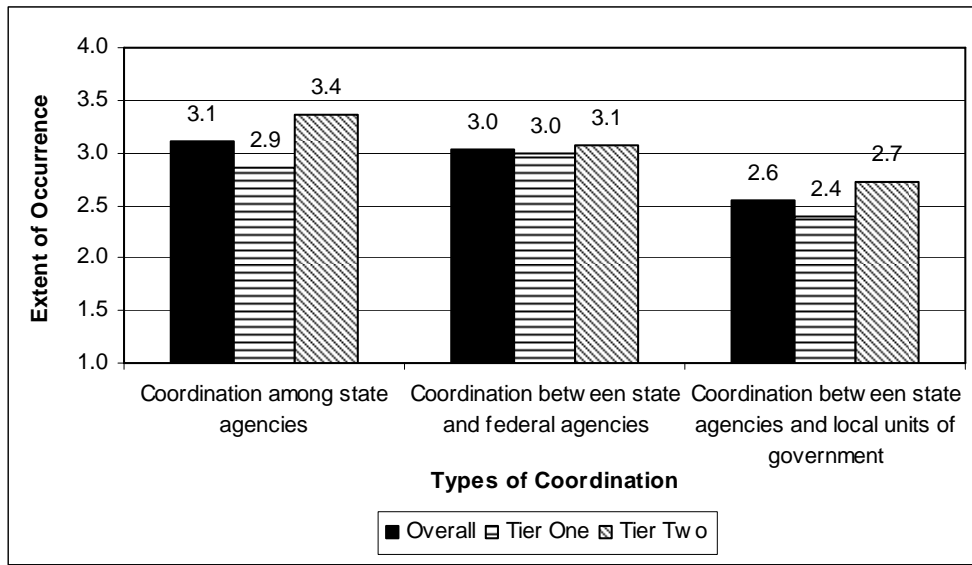


Figure 2. Coordination in a CIA process.

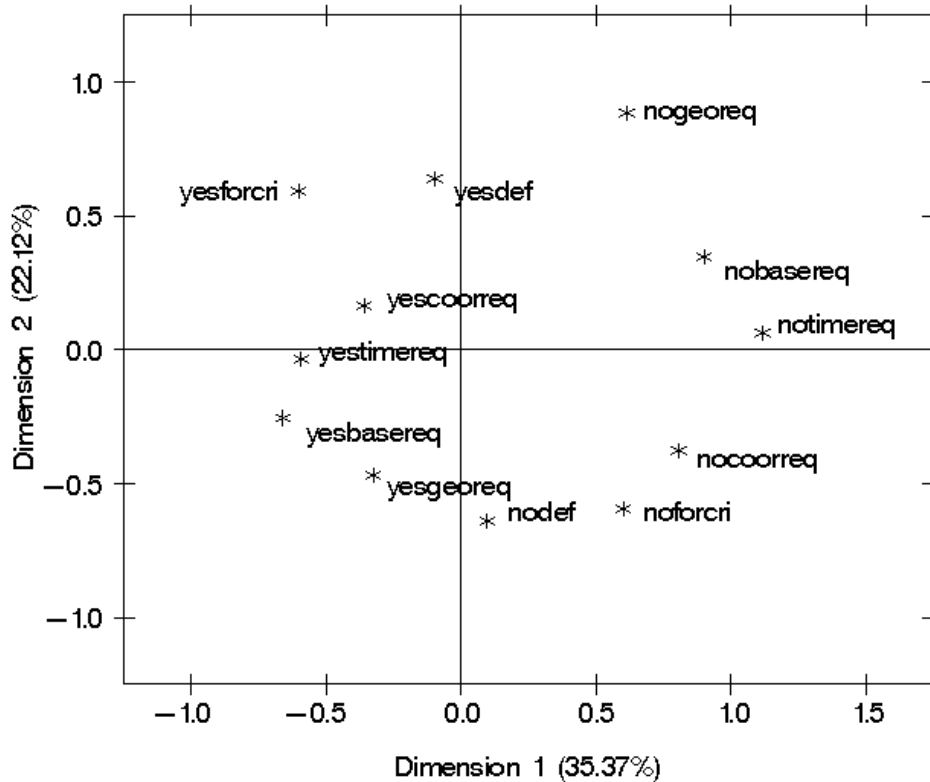


Figure 3. A correspondence map of state CIA policy attributes.

Note: The category values shown in this correspondence map indicate the following CIA policy attributes.

- yesdef – the adoption of cumulative impact definition
- nodef – no adoption of cumulative impact definition
- yesgeoreq – the adoption of requirements for using geographic scales in a CIA process
- nogeoreq – the adoption of requirements for using geographic scales in a CIA process
- yesestimereq – the adoption of requirements for using time scales in a CIA process
- notestimereq – no adoption of requirements for using time scales in a CIA process
- yesbasereq – the adoption of requirements for using baselines in a CIA process
- nobasereq – the adoption of requirements for using baselines in a CIA process
- yesforcricri – the adoption of formal criteria for determining the significance of cumulative impacts
- noforcricri – no adoption of formal criteria for determining the significance of cumulative impacts
- yescoorreq – the adoption of requirements for intergovernmental coordination in a CIA process
- nocoorreq – the adoption of requirements for intergovernmental coordination in a CIA process

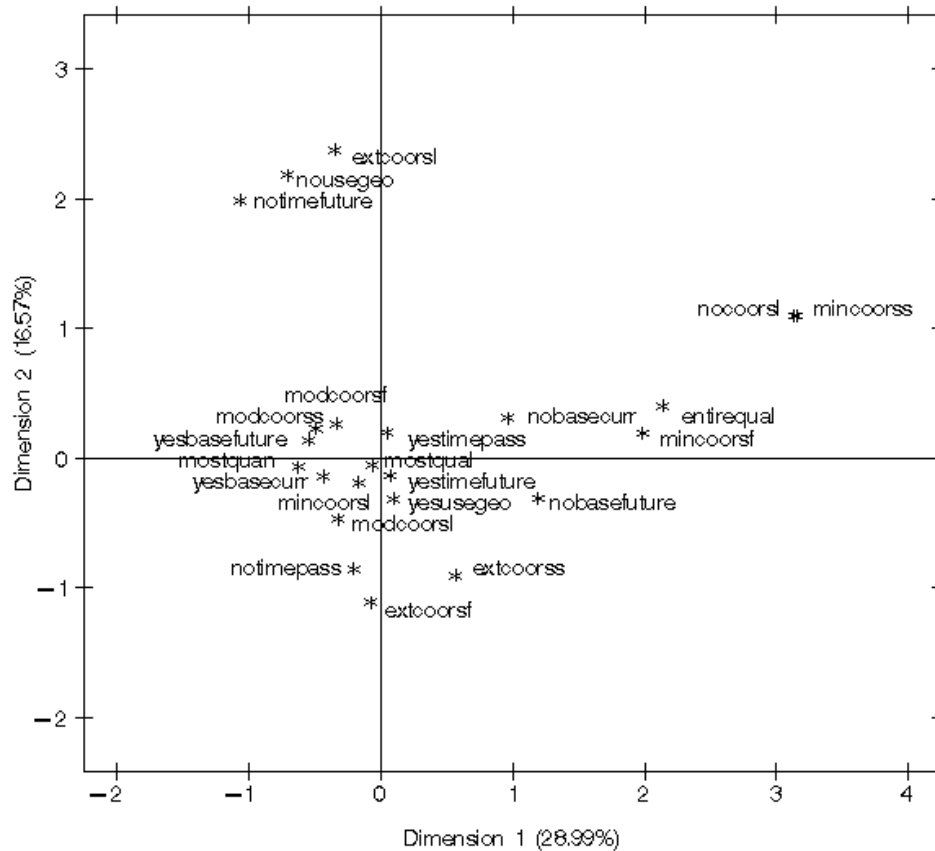


Figure 4. A correspondence map of state CIA practice attributes.

Note: The category values shown in this correspondence map indicate the following CIA policy attributes

yesusegeo – using geographic scales
 nousegeo – not using geographic scales
 yestimepass – considering past projects
 notimepass – not considering past projects
 yestimefuture – considering future projects
 notimefuture – not considering future projects
 yesbasecurr – using current baseline conditions
 nobasecurr – not using current baseline conditions
 yesbasefuture – using future baseline conditions
 nobasefuture – not using future baseline conditions
 entirequan – using entirely quantitative methods
 mostquan – using mostly quantitative methods
 entirequal – using entirely qualitative methods
 mostqual – using mostly qualitative methods
 extcoors – extensive coordination among state agencies
 modcoors – moderate coordination among state agencies

mincoors – minimal coordination among state agencies
 extcoorsf – extensive coordination between state and federal agencies
 modcoorsf – moderate coordination between state and federal agencies
 mincoorsf – minimal coordination between state and federal agencies
 extcoorsl – extensive coordination between state and local agencies
 modcoorsl – moderate coordination between state and local agencies
 mincoorsl – minimal coordination occurs between state and local agencies
 nocoorsl – no coordination occurs among between state and local agencies

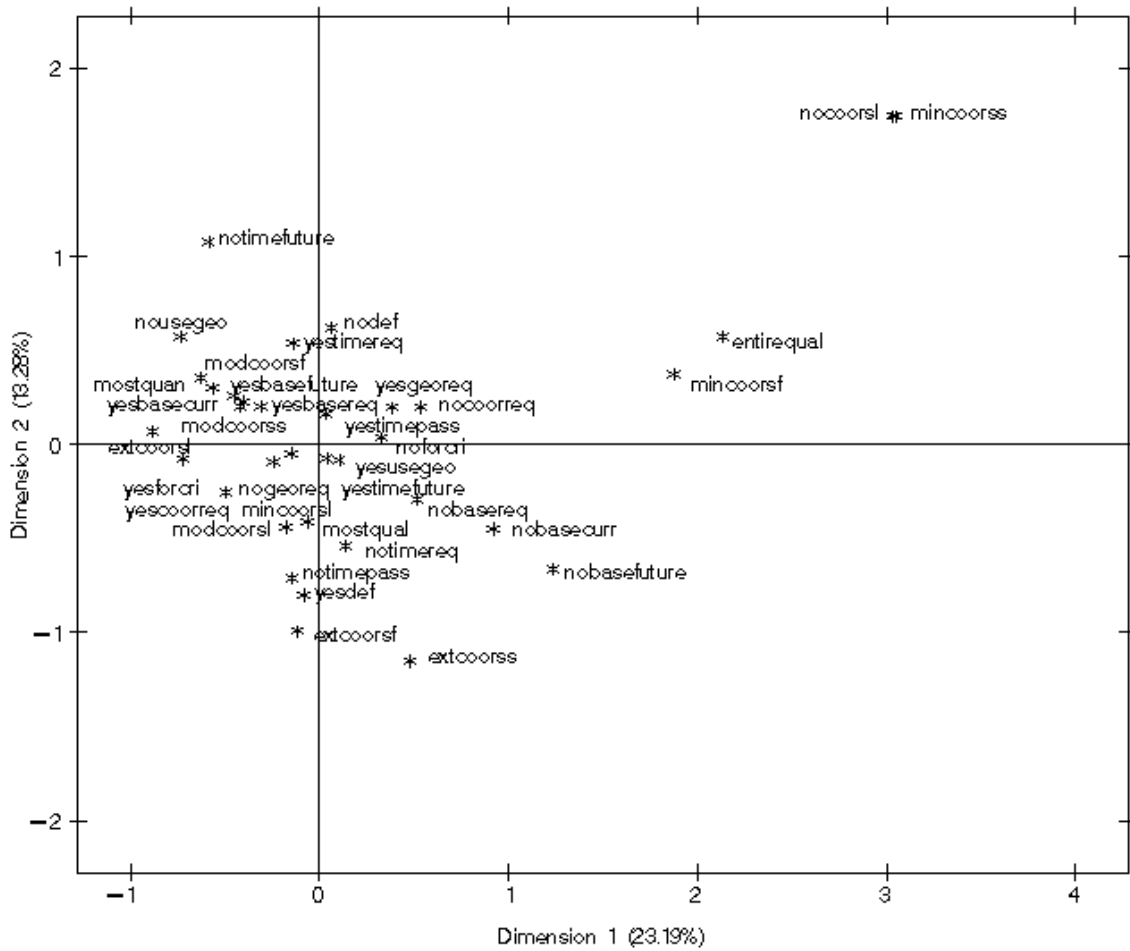


Figure 5. A correspondence map of state CIA policies and practices attributes.

Note: All the category values shown in this correspondence map are explained in the notes below Figure 3 and Figure 4.

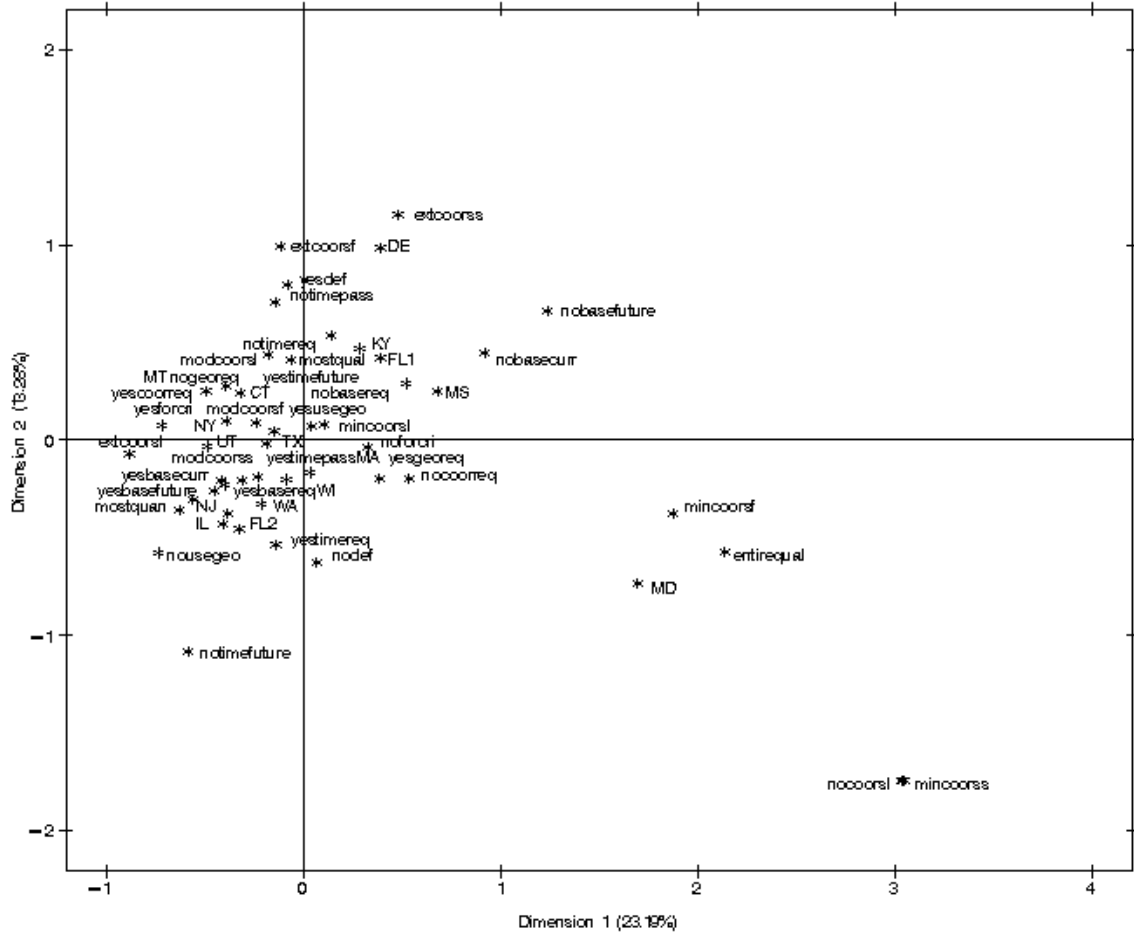


Figure 6. A correspondence map of state CIA policies and practices attributes with program identifications.

Note: All the category values shown in this correspondence map are explained in the notes below Figure 3 and Figure 4.

APPENDIX A
SURVEY QUESTIONNAIRE FOR TIER-ONE STATES

Survey of
State Environmental Review and
Cumulative Environmental Impact Assessment Policies, Procedures, and Perspectives

This survey requests information about your state's environmental review program and how it addresses **cumulative environmental impacts** of proposed projects. The survey is sponsored by the University of Minnesota's Department of Forest Resources and Graduate School. Please answer the following questions to the best of your knowledge, using the glossary on pages 12 and 13 as necessary.

DIRECTIONS:

Focus responses only on your state's environmental review policies and procedures. Federal environmental review requirements and practices as they relate to NEPA are not a concern of this study. We are only interested in environmental reviews conducted by state and local governments per state environmental review processes.

The survey will take approximate 20 to 30 minutes to complete. All responses will be kept confidential and only summaries of responses will be reported. If you have any questions, please contact:

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Please return the survey in the enclosed self-addressed, postage-paid envelop by **July 25, 2007**.

Thank you for your participation!

SECTION I. ADMINISTRATION OF STATE PROGRAMS

1. Name and contact information of the person who answers the survey

Name _____
 Title _____
 Agency/Organization _____
 Phone Number _____
 Email Address _____

2. Indicate the number of full-time equivalent professional staff within your agency who assists in administering your state’s environmental review (ER) programs. (Definition of ER programs is on Page 12)

3. Indicate where the requirements for assessing cumulative environmental impacts are delineated in your state. (Definition of cumulative environmental impact is on Page 12) Please check all that apply

- ___ State statutes
- ___ Administrative rules
- ___ Agency guidelines, manuals, or policy directives
- ___ Not required
- ___ Required through other means. Please specify: _____

4. Indicate which of the following types of state and local ER documents have been used in your state to assess cumulative environmental impacts. (Descriptions of ER documents can be found on Page 12) Please circle one number for each type of ER documents

State and local ER documents	Yes	No	Not Sure	Not Applicable
Environmental Assessment (EA)	2	1	9	0
Environmental Impact Statement (EIS)	2	1	9	0
Related Actions EIS	2	1	9	0
Alternative Urban Areawide Review (AUAW)	2	1	9	0
Generic EA or EIS (GEA/GEIS)	2	1	9	0
Programmatic EA or EIS	2	1	9	0
Master EA or EIS	2	1	9	0
Comprehensive Environmental Analysis (CEA)	2	1	9	0
System-plan Environmental Evaluation (SEE)	2	1	9	0
Other, please specify: _____	2	1	9	0

5. Estimate the average annual number of state and local ER documents (including EAs and EISs) prepared and released for public review over the last 10 years.

6. Estimate the percent of state and local EAs or EISs (and equivalent documents) prepared and released for public review over the last 10 years that have explicitly assessed cumulative environmental impacts. Please circle one number for each row

	More than 75%	50-75%	25-49%	Less than 25%	Not Applicable
EAs and equivalent documents	4	3	2	1	0
EISs and equivalent documents	4	3	2	1	0

7. Estimate the percent of state and local ER documents (including EAs and EISs) prepared and released for public review over the last 10 years that have explicitly assessed cumulative environmental impacts regarding the following issues and conditions. Please circle one number for each issue or condition

Issues or Conditions	More than 75%	50-75%	25-49%	Less than 25%	Not Applicable
Soil erosion and sedimentation	4	3	2	1	0
Ground or surface water <u>quality</u>	4	3	2	1	0
Ground or surface water <u>quantity</u>	4	3	2	1	0
Wetlands	4	3	2	1	0
Flooding	4	3	2	1	0
Air quality	4	3	2	1	0
Noise	4	3	2	1	0
Transportation	4	3	2	1	0
Odor	4	3	2	1	0
Forest resources	4	3	2	1	0
Wildlife habitat	4	3	2	1	0
Land development and conversion	4	3	2	1	0
Recreation opportunities	4	3	2	1	0
Fisheries	4	3	2	1	0
Mineral mining	4	3	2	1	0
Non-metallic mining	4	3	2	1	0
Other, please specify: _____	4	3	2	1	0

8. Indicate your perception of the ease or difficulty in assessing cumulative environmental impacts regarding the following issues or conditions. Please circle one number for each issue or condition

Issues or Conditions	Very Easy	Moderately Easy	Neither Easy nor Difficult	Moderately Difficult	Very Difficult	Not Applicable
Soil erosion and sedimentation	5	4	3	2	1	0
Ground or surface water <u>quality</u>	5	4	3	2	1	0
Ground or surface water <u>quantity</u>	5	4	3	2	1	0
Wetlands	5	4	3	2	1	0
Flooding	5	4	3	2	1	0
Air quality	5	4	3	2	1	0
Noise	5	4	3	2	1	0
Transportation	5	4	3	2	1	0
Odor	5	4	3	2	1	0
Forest resources	5	4	3	2	1	0
Wildlife habitat	5	4	3	2	1	0
Land development and conversion	5	4	3	2	1	0
Recreation opportunities	5	4	3	2	1	0
Fisheries	5	4	3	2	1	0
Mineral mining	5	4	3	2	1	0
Non-metallic mining	5	4	3	2	1	0
Other, please specify: _____	5	4	3	2	1	0

SECTION II. GEOGRAPHIC SCALES FOR ASSESSING CUMULATIVE IMPACTS

Geographic scale refers to the geographic boundaries within which proposed actions, as well as relevant past, present and future actions are considered for assessing cumulative environmental impacts.

9. Indicate where the requirements for using geographic scales for assessing cumulative environmental impacts are delineated in your state. Please check all that apply

- State statutes
- Administrative rules
- Agency guidelines, manuals, or policy directives
- Not delineated
- Delineated through other means. Please specify: _____

10. Indicate the frequency and usefulness of using the following geographic scales for assessing cumulative environmental impacts in your state. Please specify a percentage and circle one number for each scale

Geographic Scales	Frequency of using a scale	Very Useful	Moderately Useful	Minimally Useful	Not Useful	Not Applicable
Project site	_____ %	4	3	2	1	0
Radius of a project site, please specify the radius most often used: _____	_____ %	4	3	2	1	0
A political unit, such as a county or township, please specify the unit most often used: _____	_____ %	4	3	2	1	0
Statewide	_____ %	4	3	2	1	0
Beyond state boundaries	_____ %	4	3	2	1	0
An eco-region	_____ %	4	3	2	1	0
A watershed	_____ %	4	3	2	1	0
Other, please specify: _____	_____ %	4	3	2	1	0
Total = 100 %						

SECTION III. TIME SCALES FOR ASSESSING CUMULATIVE IMPACTS

Time scale refers to the time boundaries of how far into the past and future to analyze cumulative environmental impacts.

11. Indicate where the requirements for using time scales for assessing cumulative environmental impacts are delineated in your state. Please check all that apply

- ____ State statutes
- ____ Administrative rules
- ____ Agency guidelines, manuals, or policy directives
- ____ Not delineated
- ____ Delineated through other means. Please specify: _____

12. Estimate the percent of state and local ER documents, prepared and released for public review over the past 10 years, in which past environmental impacts have been considered for assessing cumulative environmental impacts. Please circle only one number

More than 75%	50-75%	25-49%	Less than 25%	Not Applicable
4	3	2	1	0

13. Indicate the frequency and usefulness of using the following time scales for assessing cumulative environmental impacts in your state. Please specify a percentage and circle one number for each scale

Time Scales	Frequency of using a scale	Very Useful	Moderately Useful	Minimally Useful	Not Useful	Not Applicable
Type I: Projects that have defined lifetime (e.g., industrial facilities)						
A project's construction period	_____ %	4	3	2	1	0
A project's construction and operation period	_____ %	4	3	2	1	0
Beyond a project's construction and operation period	_____ %	4	3	2	1	0
Total = 100 %						
Type II: Projects that do NOT have defined lifetime (e.g., residential and commercial development)						
A project's construction period	_____ %	4	3	2	1	0
Beyond a project's construction period	_____ %	4	3	2	1	0
Total = 100 %						
Type III: Plans, policies and programs that do NOT contain specific project proposals						
Time scale 1: _____	_____ %	4	3	2	1	0
Time scale 2: _____	_____ %	4	3	2	1	0
Total = 100 %						

SECTION IV. BASELINE CONDITIONS FOR ASSESSING CUMULATIVE IMPACTS

To determine the magnitude of predicted cumulative environmental impacts, one needs to define an appropriate baseline condition for the resource, ecosystem, and human community against which to compare the predicted impacts of proposed actions, while considering other relevant past, present and future actions.

14. Indicate where the requirements for using baseline conditions for assessing cumulative environmental impacts are delineated in your state. Please check all that apply

- ___ State statutes
- ___ Administrative rules
- ___ Agency guidelines, manuals, or policy directives
- ___ Not delineated
- ___ Delineated through other means. Please specify: _____

15. Indicate the frequency and usefulness of using the following baseline conditions for assessing cumulative environmental impacts in your state. Please specify a percentage and circle one number for each baseline

Baseline Conditions	Frequency of using baseline	Very Useful	Moderately Useful	Minimally Useful	Not Useful	Not Applicable
Current environmental condition before the project is implemented	_____ %	4	3	2	1	0
Future environmental condition without the project being implemented	_____ %	4	3	2	1	0
Other, please specify: _____	_____ %	4	3	2	1	0

Total = 100 %

SECTION V. CRITERIA FOR DETERMINING SIGNIFICANCE OF CUMULATIVE IMPACTS

The criteria (or thresholds) for determining the significance of cumulative environmental impacts refer to the levels of acceptable cumulative change, which can be measured quantitatively or qualitatively.

16. Indicate how your state determines whether the cumulative environmental impacts of a proposed project are significant. Please check all that apply

- ___ State statutes determine the significance of cumulative impacts.
- ___ Agency rules determine the significance of cumulative impacts.
- ___ Agency guidelines, manuals, or policy directives determine the significance of cumulative impacts.
- ___ The person who prepares an ER document determines the significance of cumulative impacts.
- ___ Experts' opinions determine the significance of cumulative impacts.
- ___ Mitigation measures are taken into account when determining the significance of cumulative impacts.
- ___ Resource conditions are taken into account when determining the significance of cumulative impacts.
- ___ My state has one set of significance criteria that are applied to all proposed projects.
- ___ My state has several sets of significance criteria that vary according to the type of proposed projects.
- ___ The significance of cumulative environmental impacts are not formally defined.
- ___ Other, please specify: _____

17. Indicate the usefulness of the criteria that are used in your state to determine the significance of cumulative environmental impacts. Please circle only one number

Very Useful	Moderately Useful	Minimally Useful	Not Useful	Not Applicable
4	3	2	1	0

SECTION VI. ANALYTIC METHODS FOR ASSESSING CUMULATIVE IMPACTS

18. Assessments of cumulative environmental impacts can be qualitative (e.g., using opinions or judgments) or quantitative (e.g., using instruments or models). Indicate which of the following best describes the analytic methods commonly used to assess cumulative impacts in your state. Please circle only one number

Analytic methods commonly used in my state are:	Entirely Quantitative	Mostly Quantitative	Mostly Qualitative	Entirely Qualitative	Not Applicable
	4	3	2	1	0

19. Based on your experience, indicate how often the following data gathering and analytic methods are used when assessing cumulative environmental impacts in your state. (Descriptions of data gathering and analytic methods can be found on Page 13) Please circle one number for each method

Data Gathering and Analytic Methods	Always	Often	Sometimes	Rarely	Never
Questionnaires, interviews, focus groups, or panels	5	4	3	2	1
Environmental checklist	5	4	3	2	1
Matrices	5	4	3	2	1
Networks and system diagrams	5	4	3	2	1
Modeling	5	4	3	2	1
Trends analysis	5	4	3	2	1
Overlay mapping and Geographic Information System (GIS)	5	4	3	2	1
Carrying capacity analysis	5	4	3	2	1
Ecosystem analysis	5	4	3	2	1
Other, please specify: _____	5	4	3	2	1

SECTION VII. COORDINATION OF ENVIRONMENTAL REVIEW DOCUMENTS

20. Indicate the extent coordination occurs in your state during the process of preparing a state or local ER document that assesses cumulative environmental impacts and prior to its public distribution. *Please circle one number for each level of coordination*

	Extensive Occurrence	Moderate Occurrence	Minimal Occurrence	No Occurrence
Coordination <u>among</u> state agencies	4	3	2	1
Coordination <u>between</u> state and federal agencies	4	3	2	1
Coordination <u>between</u> state agencies and local government units	4	3	2	1

21. Indicate the extent you agree or disagree with the following statements about coordination and cumulative environmental impact assessment. *Please circle one number for each statement*

	Strongly Agree	Agree	Disagree	Strongly Disagree
<u>Coordination is required</u> to fully and accurately assess cumulative impacts through state and local ER processes.	4	3	2	1
State agencies and local government units have the <u>responsibility</u> to coordinate an assessment of cumulative impacts.	4	3	2	1
Environmental review processes give state agencies and local government units adequate <u>time</u> to coordinate an assessment of cumulative impacts.	4	3	2	1
State agencies and local government units have adequate <u>staff</u> to coordinate an assessment of cumulative impacts.	4	3	2	1
State agencies and local government units have adequate <u>technical expertise</u> to coordinate an assessment of cumulative impacts.	4	3	2	1
State <u>laws and/or rules</u> encourage coordination among local, state and federal agencies when assessing cumulative impacts.	4	3	2	1
<u>Procedures for coordination</u> among local, state and federal agencies are clearly defined for assessing cumulative impacts.	4	3	2	1

SECTION VIII. BARRIERS TO ASSESSING CUMULATIVE IMPACTS

22. Indicate the extent you consider the following statements as “barriers” to addressing cumulative environmental impacts for your state. Please circle one number for each statement

	Significant Barrier	Moderate Barrier	Minimal Barrier	Not a Barrier
a. Ambiguous definition of cumulative impacts	4	3	2	1
b. Ambiguous legal requirement for assessing cumulative impacts	4	3	2	1
c. Lack of explicit procedures for assessing cumulative impacts	4	3	2	1
d. Poor understanding of appropriate geographic scales for assessing cumulative impacts	4	3	2	1
e. Poor understanding of appropriate time scales for assessing cumulative impacts	4	3	2	1
f. Poor understanding of appropriate baseline for assessing cumulative impacts	4	3	2	1
g. Lack of criteria for determining the significance of a proposed project’s cumulative impacts	4	3	2	1
h. Lack of practical analytic methods for assessing cumulative impacts	4	3	2	1
i. Lack of alternative forms of ER for assessing cumulative impacts (other than standard EAs or EISs)	4	3	2	1
j. Limited legal timeframe for preparing ER documents	4	3	2	1
k. Lack of technical expertise to assess cumulative impacts	4	3	2	1
l. Lack of recognition of the importance of assessing cumulative impacts among ER program staff	4	3	2	1
m. Lack of data and information needed to assess cumulative impacts	4	3	2	1
n. Limited access to data and information for businesses and industries, state agencies, and local government units to assess cumulative impacts	4	3	2	1
o. Insufficient coordination among local, state, and federal agencies	4	3	2	1
p. Businesses and industries generally do not support assessments of cumulative impacts	4	3	2	1
q. Lack of general public support for assessing cumulative impacts	4	3	2	1
r. Assessing cumulative impacts may lengthen a proposed project’s ER process	4	3	2	1
s. Other, please specify: _____	4	3	2	1

Identify the top three (3) barriers for your state. Use the space on next page for further explanation if necessary:

SECTION IX. WAYS OF IMPROVING ASSESSMENTS OF CUMULATIVE IMPACTS

23. Indicate the usefulness of the following for doing a better job of assessing cumulative environmental impacts in your state. Please circle one number for each statement

	Very Useful	Moderately Useful	Minimally Useful	Not Useful
State statutes and administrative rules are adopted to provide more explicit requirements for assessing cumulative impacts.	4	3	2	1
Agency guidelines are developed to provide more explicit guidance for assessing cumulative impacts.	4	3	2	1
Business and industry gain a better understanding and appreciation of the importance of assessing cumulative impacts.	4	3	2	1
State agencies become more involved in state and local cumulative impact assessment processes.	4	3	2	1
Federal agencies become more involved in state and local cumulative impact assessment processes.	4	3	2	1
Local government units become more involved in state and local cumulative impact assessment processes.	4	3	2	1
Public comments on proposed projects are explicitly related to cumulative impacts.	4	3	2	1
Judicial system provides more explicit guidance on <u>when</u> to assess cumulative impacts.	4	3	2	1
Judicial system provides more explicit guidance on the <u>standards</u> for analyzing cumulative impacts and preparing a cumulative impact assessment.	4	3	2	1
Judicial system provides more explicit guidance on <u>how</u> to determine the significance of a proposed project's cumulative impacts.	4	3	2	1
Other, please specify: _____	4	3	2	1

SECTION X. OUTCOMES OF ASSESSING CUMULATIVE IMPACTS

24. Indicate the extent you agree or disagree with the following statements about assessments of cumulative environmental impacts in your state. Please circle one number for each statement

	Strongly Agree	Agree	Disagree	Strongly Disagree
Assessing cumulative impacts has enhanced /would enhance my state’s ability to fully identify the environmental impacts of a proposed project.	4	3	2	1
Assessing cumulative impacts has improved /would improve my state’s environmental and development permitting decisions.	4	3	2	1
The assessment of cumulative impacts has been a financial burden to businesses and industries in my state.	4	3	2	1
The assessment of cumulative impacts has been a financial burden to state agencies in my state.	4	3	2	1
The assessment of cumulative impacts has been a financial burden to local government units in my state.	4	3	2	1
The assessment of cumulative impacts has slowed down the ER process of proposed projects in my state.	4	3	2	1

Section XI. ADDITIONAL INFORMATION

25. Please share any other comments you have on your state’s environmental review program and the assessment of cumulative environmental impacts:

Thank you for taking time to complete this survey!
If you are interested in the results of the survey, please check here

Please return the survey and any attached documents by July 25, 2007.

Glossary

State environmental review program (state ER program): Several states have adopted state environmental review laws that are generally modeled after the National Environmental Policy Act. State environmental review laws require state and/or local governments to conduct ER on certain actions to determine whether those actions will have significant impacts on the environment. A state ER program is the mechanism by which a state implements its environmental review laws and oversees its state and local ER processes, including adopting administrative rules, establishing an ER coordinating body, distributing ER responsibilities among state agencies and local government units, and other related instruments .

Cumulative environmental impact: The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions.

Environmental Assessment (EA): A document providing basic information about a project's (potential) environmental impacts. An EA is prepared to determine whether an Environmental Impact Statement should be prepared.

Environmental Impact Statement (EIS): A thorough study of a project's (potential) environmental impacts, often including evaluation of alternatives and mitigation.

Related Actions EIS: A single EIS prepared for independent projects with potential cumulative environmental impacts on the same geographic area.

Alternative Urban Areawide Review (AUAW): A substitute review process based on review of development scenarios for an entire geographic area rather than for a specific project.

Generic EA or EIS (GEA or GEIS): A generic EA or EIS may be used to assess the environmental effects of actions likely to be repeated on a recurring basis or actions which have relevant similarities such as effects on the environment, timing, alternatives, and methods of implementation or subject matter. When subsequent individual project locations, time schedules and similar descriptive information are not reasonably available, the generic EA or EIS may be more general than a site specific EA or EIS. It may present and analyze in general terms several hypothetical scenarios that are likely to occur. It shall specify conditions or criteria of subsequent individual proposed action which are adequately evaluated by the generic EA or EIS, and also specify criteria for proposed action which require further evaluation with a site specific EA or EIS.

Programmatic EA or EIS: A programmatic EA or EIS may be prepared on a series of actions that can be characterized as one large project and are related either (1) geographically, (2) a logical parts in the chain of contemplated actions, (3) in connection with issuance of rules, regulations, plans, or other general criteria to govern the conduct of a continuing program, or (4) as individual activities carried out under the same authorizing statutory or regulatory authority and having generally similar environmental effects.

Master EA or EIS: A master EA or EIS is suggested as an approach to identify and organize environmental information for a region or area of the state. A master EA or EIS can assist in identifying long range, areawide, and cumulative impacts of individual projects proposed in the area covered by a master plan.

Comprehensive Environmental Analysis (CEA): When an EA or EIS is required for a proposal involving multiple agency actions which involve impacts that may cumulatively be significant when considered with other agency actions related to the proposal, the entire project proposal including all related agency actions may be addressed in a CEA.

System-plan Environmental Evaluation (SEE): A conceptual environmental evaluation comparable to an EIS. A SEE may be prepared for proposed actions contained in any system plan, which is a plan that identifies transportation facility or service needs for a statewide system. The needs are identified conceptually without addressing specific design and locational details. Therefore, by necessity, a SEE shall be more conceptual, qualitative, and general than is common with the individual project ER. A SEE addresses the range of environmental effects of a system plan in a whole, including the cumulative effects of all elements in the plan.

Description of Data Gathering and Analytical Methods for Assessing Cumulative Environmental Impacts

Data Gathering and Analytical Methods	Description
Questionnaires, interviews, and panels	Questionnaires, interviews, and panels are useful for gathering the wide range of information on multiple actions and resources needed to address cumulative impacts. Brainstorming sessions, interviews with knowledgeable individuals, and group consensus building activities can help identify the important cumulative impact issues in the region.
Environmental checklists	Environmental checklists help identify potential cumulative impacts by providing a list of common or likely effects and juxtaposing multiple actions and resources. They are sometimes used as a shortcut to thorough scoping and conceptualization of cumulative impacts problems.
Matrices	Matrices use the familiar tabular format to organize and quantify the interactions between human activities and resources of concern. Once even relatively complex numerical data are obtained, matrices are well-suited to combining the values in individual cells of the matrix to evaluate the cumulative impacts of multiple actions on individual resource, ecosystems, and human communities.
Network and system diagrams	Networks and system diagrams are an excellent method for delineating the cause-and-effect relationship resulting in cumulative impacts. They allow the user to analyze the multiple, subsidiary effects of various actions and trace indirect effects to resources that accumulate from direct effects on other resources.
Modeling	Modeling is a powerful technique for quantifying the cause-and-effect relationships leading to cumulative impacts, can take the form of mathematical equations describing cumulative processes such as soil erosion, or may constitute an expert system that computes the effect of various project scenarios based on a program of logical decisions.
Trends analysis	Trends analysis assesses the status of a resource, ecosystem, and human community over time and usually results in a graphical projection of past or future conditions. Changes in the occurrence or intensity of stressors over the same time period can also be determined. Trends can help the analyst identify cumulative impacts problems, establish appropriate environmental baselines, or project future cumulative impacts.
Overlay mapping and Geographic Information System (GIS)	Overlay mapping and GIS incorporate locational information into the assessment of cumulative impacts and help set the boundaries of the analysis, analyze landscape parameters, and identify areas where impacts will be the greatest. Map overlays can be based on either the accumulation of stresses in certain areas or on the suitability of each land unit for development.
Carrying capacity analysis	Carrying capacity analysis identifies thresholds (as constraints on development) and provides mechanisms to monitor the incremental use of unused capacity. Carrying capacity in the ecological context is defined as the threshold of stress below which populations and ecosystem functions can be sustained.
Ecosystem analysis	Ecosystem analysis explicitly addresses biodiversity and ecosystem sustainability. The ecosystem approach uses natural boundaries (such as watersheds and ecoregions) and applies new ecological indicators such as indices of biotic integrity and landscape pattern). Ecosystem analysis entails the broad regional perspective and holistic thinking that are required for successful assessment of cumulative impacts.

Source: Council on Environmental Quality (CEQ). 1997. Considering cumulative effects under the National Environmental Policy Act. Washington, DC: Council on Environmental Quality.

APPENDIX B
COVER LETTER FOR TIER-ONE STATES

July 11, 2007

Mr. XXXX
Address
(City), (State) (Post code)

Dear Mr. XXXX:

As indicated in the email we sent to you on June 29, we are requesting your assistance in a study being conducted by the University of Minnesota with help from the Minnesota Pollution Control Agency. The purpose of the study is to identify challenges and opportunities to effective cumulative environmental impact assessment at the state level. We are assessing state-level environmental review (ER) processes for all 50 states in an effort to identify best practices, common challenges, and implementation strategies for conducting cumulative impact assessment. The results of our study will be provided to state ER programs to assist in effective practices across the country.

As you are aware, the challenges of assessing cumulative impacts are significant and vary from state to state. Differences in experiences, state statutes, agency rules, and the natural resource base all contribute to differences in how state ER programs are administered. We have learned that your state has adopted a state environmental policy act (SEPA) and as such we would like to better understand the policies, procedures, and perspectives you have for assessing cumulative impacts. We expect to complete this study in October, 2007 and will email you a copy of the study report when it is available.

Please complete and return the survey questionnaire by **July 25, 2007**. Your assistance is greatly appreciated in gaining participation from all states. If you are not able to complete the questionnaire or feel that another individual is better suited, please contact us with their information. It will take approximately 20 to 30 minutes to complete the questionnaire. All responses will be kept confidential and only summaries of responses will be reported.

Thank you for your time and consideration and please do not hesitate to contact us if you have questions or concerns. Zhao Ma can be reached at 612-624-4280 or by email at maxxx103@umn.edu. Dennis Becker can be reached at 612-624-7286 or by email at drbecker@umn.edu. We look forward to working with you and assisting in your efforts to conducting effective state environmental review.

Sincerely,

Zhao Ma, Ph.D. Candidate
Department of Forest Resources
University of Minnesota

Dennis Becker, Ph.D., Assistant Professor
Department of Forest Resources
University of Minnesota

Enclosures: (1) survey questionnaire and (2) self-addressed, stamped return envelope

APPENDIX C
SURVEY QUESTIONNAIRE FOR TIER-TWO STATES

**Survey of
State Environmental Review
Requirements and Practices**

This survey requests information about environmental review requirements and practices for proposed projects undertaken, permitted, funded, approved, or certified by your agency. This survey is sponsored by the University of Minnesota's Department of Forest Resources and Graduate School. Please answer the following questions to the best of your knowledge.

PLEASE NOTE: Focus your responses only on your agency's environmental review policies and procedures. Federal environmental review requirements and practices as they relate to NEPA are not a concern of this study — we are only interested in environmental reviews conducted or required by your agency.

The survey will take approximate 20 minutes to complete. All responses will be kept confidential and only summaries of responses will be reported. Individual responses will not be disclosed.

If you have any questions about this survey or our research, please feel free to contact:

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Fax: 612-625-5212
Email: drbecker@umn.edu

Please return the survey by **August 24, 2007**.

Thank you very much for your participation!

SECTION I. STATE ENVIRONMENTAL REVIEW POLICIES AND PROCEDURES

The terms used in this section are defined as follows:

Environmental review (ER) refers to the process of assessing potential environmental impacts of a proposed project or plan. An ER may be conducted by an agency prior to undertaking a project, or conducted as part of the permitting, funding, approving, or certifying process. An ER is often used to inform an agency’s decision-making. An **ER document** refers to a written analysis of the impacts of a proposed project or plan on the environment. An ER document may be in a form of an environmental assessment, environmental impact statement, environmental evaluation, or other type of written environmental analysis as required by your state.

Environmental assessment (EA) refers to a study providing basic information about a project’s potential environmental impacts. An EA is normally used to determine the need for an environmental impact statement.

Environmental impact statement (EIS) refers to a thorough study of a project’s (potential) environmental impacts, often including evaluation of alternatives and mitigation.

1. Name and contact information of the person who answers the survey

Name _____
Title _____
Agency/Organization _____
Phone Number _____
Email Address _____

2. Indicate under which of the following conditions your agency might require an ER document be prepared to assess the potential environmental impacts of proposed activities. Please check all that apply

- ___ When my agency is the proposer of a project.
- ___ When my agency is responsible for issuing permits for (or approving) a proposed project.
- ___ When my agency provides funding for a proposed project.
- ___ Other, please specify: _____

3. Indicate the number of full-time equivalent professional staff within your agency that assists in administering your agency’s ER process.

4. Estimate the average annual number of ER documents prepared by your agency over the last 10 years.

5. Indicate how many times in the past 3 years your agency has denied permit, grants, approval, or certification for a proposed project (including proposals that have been withdrawn) based on the results of your agency’s ER process. Please explain your answer if necessary

6. Indicate the usefulness of your agency’s ER process for promoting environmentally-sound permitting, funding, approving, or certifying decisions. *Please check only one number*

Very Useful	Moderately Useful	Minimally Useful	Not Useful
4	3	2	1

SECTION II. COORDINATION OF STATE ENVIRONMENTAL REVIEW PROCESSES

7. Indicate the extent that you are aware of ER requirements and related processes administered by other agencies in your state. *Please check only one number*

Very Aware	Moderately Aware	Minimally Aware	Not Aware
4	3	2	1

8. Indicate, in your opinion, the consistency of ER requirements and related ER activities between your agency and other agencies in your state. *Please check only one number*

Very Consistent	Moderately Consistent	Minimally Consistent	Not Consistent
4	3	2	1

9. Indicate the extent that coordination occurs during the process of preparing an ER document. *Please check one number for each level of coordination*

	Extensive Occurrence	Moderate Occurrence	Minimal Occurrence	No Occurrence
Coordination among divisions <u>within</u> my agency	4	3	2	1
Coordination between my agency and <u>other state agencies</u>	4	3	2	1
Coordination between my agency and <u>federal agencies</u>	4	3	2	1
Coordination between my agency and <u>local government units</u>	4	3	2	1

10. Indicate the extent you agree or disagree with the following statements. Please check one number for each statement

	Strongly Agree	Agree	Disagree	Strongly Disagree
<u>Coordination is necessary</u> among local, state, and federal agencies in my state to fully and accurately assess environmental impacts of a proposed project.	4	3	2	1
My agency has the <u>responsibility</u> to coordinate with other local, state, and federal agencies in my state when preparing assessments of environmental impacts required by my agency.	4	3	2	1
<u>State laws and/or agency rules</u> in my state encourage coordination among local, state and federal agencies during ER processes.	4	3	2	1
<u>Procedures for coordination</u> among local, state and federal agencies are clearly defined for my agency.	4	3	2	1
There is a need for <u>consistent ER requirements</u> among state agencies in my state.	4	3	2	1
There is a need for <u>facilitating coordination</u> among local, state, and federal agencies in my state with respect to effectively assessing environmental impacts.	4	3	2	1
There is a need for <u>information sharing</u> among local, state, and federal agencies in my state during an ER process.	4	3	2	1

SECTION III. BARRIERS TO ASSESSING ENVIRONMENTAL IMPACTS

11. Indicate the extent you consider the following statements as “barriers” to assessing a proposed project’s environmental impacts for your agency. Please check one number for each statement

	Significant Barrier	Modera te Barrier	Minima l Barrier	Not a Barrier
a. Ambiguous legal requirement for assessing environmental impacts	4	3	2	1
b. Lack of explicit procedures for assessing environmental impacts	4	3	2	1
c. Lack of criteria for determining the significance of a proposed project’s environmental impacts	4	3	2	1
d. Lack of practical analytic methods for assessing environmental impacts	4	3	2	1
e. Limited legal timeframe for assessing environmental impacts	4	3	2	1
f. Lack of technical expertise to assess environmental impacts	4	3	2	1
g. Lack of agency staff to assess environmental impacts	4	3	2	1
h. Lack of recognition of the importance of assessing environmental impacts among agency staff	4	3	2	1
i. Lack of data and information needed to assess environmental impacts	4	3	2	1
j. Limited access to data and information to assess environmental impacts	4	3	2	1
k. Insufficient coordination between my agency and other local, state, and federal agencies in my state	4	3	2	1
l. Businesses and industries generally do not support assessments of environmental impacts	4	3	2	1
m. Lack of general public support for assessing environmental impacts	4	3	2	1
n. Assessing environmental impacts lengthens my agency’s process of undertaking, permitting, funding, approving, or certifying a proposed project	4	3	2	1
o. Other, please specify: _____	4	3	2	1

From the above list, identify (in no rank order) the top three (3) barriers to assessing environmental impacts. Use the space below for further explanation if necessary:

SECTION IV. REQUIREMENTS FOR ASSESSING CUMULATIVE IMPACTS

The terms used in this section are defined as following:

Cumulative environmental impact refers to the impact on the environment resulting from the incremental impact of an action when considered along with other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes these other actions.

12. Indicate whether your agency considers cumulative environmental impacts when assessing a proposed project’s impact on the environment. Please check only one

- Yes, my agency considers cumulative impacts. → Continue to Question 13
- No, my agency does not consider cumulative impacts. → Continue to Question 35

13. Indicate which of the following describe the reason why your agency considers cumulative environmental impacts when assessing a proposed project’s impact on the environment. Please check all that apply

- Assessing cumulative impacts is required by state statutes.
- Assessing cumulative impacts is required by administrative rules.
- Assessing cumulative impacts is required by agency guidelines, manuals, or policy directives.
- Although it is not required, my agency considers cumulative impacts because it is important.
- Other, please specify: _____

14. Indicate where the term “cumulative environmental impact” is defined for your agency.

Please check all that apply

- State statutes
- Administrative rules
- Agency guidelines, manuals, or policy directives
- Not defined
- Defined through other means, please specify: _____

15. Estimate the percent of ER documents prepared by your agency over the last 10 years that have explicitly assessed cumulative environmental impacts for the following types of ER documents. Please check one number for each type

	More than 75%	50-75%	25-49%	Less than 25%	Not Applicable
EAs and equivalent documents	4	3	2	1	0
EISs and equivalent documents	4	3	2	1	0
Cumulative impact evaluation and equivalent documents	4	3	2	1	0
Other, please specify: _____	4	3	2	1	0

16. Estimate the percent of ER documents prepared by your agency over the last 10 years that have explicitly assessed cumulative environmental impacts regarding the following issues and conditions. *Please check one number for each issue or condition*

Issues or Conditions	More than 75%	50-75%	25-49%	Less than 25%	Not Applicable
Soil erosion and sedimentation	4	3	2	1	0
Ground or surface water <u>quality</u>	4	3	2	1	0
Ground or surface water <u>quantity</u>	4	3	2	1	0
Wetlands	4	3	2	1	0
Flooding	4	3	2	1	0
Air quality	4	3	2	1	0
Noise	4	3	2	1	0
Transportation	4	3	2	1	0
Odor	4	3	2	1	0
Forest resources	4	3	2	1	0
Wildlife habitat	4	3	2	1	0
Land development and conversion	4	3	2	1	0
Recreation opportunities	4	3	2	1	0
Fisheries	4	3	2	1	0
Mineral mining	4	3	2	1	0
Non-metallic mining	4	3	2	1	0
Other, please specify: _____	4	3	2	1	0

17. Indicate your perception of the ease or difficulty in assessing cumulative environmental impacts regarding the following issues or conditions. Please check one number for each issue or condition

Issues or Conditions	Very Easy	Moderately Easy	Neither Easy nor Difficult	Moderately Difficult	Very Difficult	Not Applicable
Soil erosion and sedimentation	5	4	3	2	1	0
Ground or surface water quality	5	4	3	2	1	0
Ground or surface water quantity	5	4	3	2	1	0
Wetlands	5	4	3	2	1	0
Flooding	5	4	3	2	1	0
Air quality	5	4	3	2	1	0
Noise	5	4	3	2	1	0
Transportation	5	4	3	2	1	0
Odor	5	4	3	2	1	0
Forest resources	5	4	3	2	1	0
Wildlife habitat	5	4	3	2	1	0
Land development and conversion	5	4	3	2	1	0
Recreation opportunities	5	4	3	2	1	0
Fisheries	5	4	3	2	1	0
Mineral mining	5	4	3	2	1	0
Non-metallic mining	5	4	3	2	1	0
Other, please specify: _____	5	4	3	2	1	0

18. Can the identification of significant cumulative environmental impacts, by itself, be a reason for denying permit for (or approval of) a proposed project? Please check only one number

Yes	No	Not Sure
1	2	9

Use the space below for further explanation if necessary:

19. Based on your experience, indicate the usefulness of assessing cumulative environmental impacts in evaluating the environmental impacts of a proposed project. Please check only one number

Very Useful	Moderately Useful	Minimally Useful	Not Useful
4	3	2	1

SECTION V. GEOGRAPHIC SCALES FOR ASSESSING CUMULATIVE IMPACTS

Geographic scale refers to the geographic boundaries within which proposed actions, as well as relevant past, present and future actions are considered for assessing cumulative environmental impacts.

20. Indicate where the requirements for using geographic scales for assessing cumulative environmental impacts are delineated for your agency. Please check all that apply

- State statutes
- Administrative rules
- Agency guidelines, manuals, or policy directives
- Not delineated
- Delineated through other means, please specify: _____

21. Indicate the frequency and usefulness of using the following geographic scales for assessing cumulative environmental impacts in your agency. Please specify a percentage and check one number for each scale

Geographic Scales	Frequency of using a scale	Very Useful	Moderately Useful	Minimally Useful	Not Useful	Not Applicable
Project site	_____ %	4	3	2	1	0
Radius of a project site. Please specify the radius most often used: _____	_____ %	4	3	2	1	0
A political unit, such as a county or township. Please specify the unit most often used: _____	_____ %	4	3	2	1	0
An eco-region	_____ %	4	3	2	1	0
A watershed	_____ %	4	3	2	1	0
Statewide	_____ %	4	3	2	1	0
Beyond state boundaries	_____ %	4	3	2	1	0
Other, please specify: _____	_____ %	4	3	2	1	0
Total = 100 %						

SECTION VI. TIME SCALES FOR ASSESSING CUMULATIVE IMPACTS

Time scale refers to the time boundaries of how far into the past and future to analyze cumulative environmental impacts.

22. Indicate where the requirements for using time scales for assessing cumulative environmental impacts are delineated in your agency. Please check all that apply

- State statutes
- Administrative rules
- Agency guidelines, manuals, or policy directives
- Not delineated
- Delineated through other means, please specify: _____

23. Estimate the percent of ER documents prepared by your agency over the past 10 years, in which past environmental impacts have been considered for assessing cumulative environmental impacts. *Please check only one number*

More than 75%	50-75%	25-49%	Less than 25%	Not Applicable
4	3	2	1	0

24. Indicate the frequency and usefulness of using the following time scales for assessing cumulative environmental impacts in your agency. *Please specify a percentage and check one number for each scale*

Time Scales	Frequency of using a scale	Very Useful	Moderately Useful	Minimally Useful	Not Useful	Not Applicable
Type I: Projects that have defined lifetime (e.g., industrial facilities)						
A project's construction period	_____ %	4	3	2	1	0
A project's construction and operation period	_____ %	4	3	2	1	0
Beyond a project's construction and operation period	_____ %	4	3	2	1	0
Total = 100 %						
Type II: Projects that do NOT have defined lifetime (e.g., residential and commercial development)						
A project's construction period	_____ %	4	3	2	1	0
Beyond a project's construction period	_____ %	4	3	2	1	0
Total = 100 %						
Type III: Plans, policies and programs that do NOT contain specific project proposals						
Time scale 1: _____	_____ %	4	3	2	1	0
Time scale 2: _____	_____ %	4	3	2	1	0
Total = 100 %						

SECTION VII. BASELINE CONDITIONS FOR ASSESSING CUMULATIVE IMPACTS

To determine the magnitude of predicted cumulative environmental impacts, one needs to define an appropriate baseline condition for the resource, ecosystem, and human community against which to compare the predicted impacts of proposed actions, while considering other relevant past, present and future actions.

25. Indicate where the requirements for using baseline conditions for assessing cumulative environmental impacts are delineated in your agency. *Please check all that apply*

- ___ State statutes
- ___ Administrative rules
- ___ Agency guidelines, manuals, or policy directives
- ___ Not delineated
- ___ Delineated through other means, please specify: _____

26. Indicate the frequency and usefulness of using the following baseline conditions for assessing cumulative environmental impacts in your agency. Please specify a percentage and check one number for each baseline

Baseline Conditions	Frequency of using baseline	Very Useful	Moderately Useful	Minimally Useful	Not Useful	Not Applicable
Current environmental condition before the project is implemented	_____ %	4	3	2	1	0
Future environmental condition without the project being implemented	_____ %	4	3	2	1	0
Other, please specify: _____	_____ %	4	3	2	1	0

Total = 100 %

SECTION VIII. DETERMINING THE SIGNIFICANCE OF CUMULATIVE IMPACTS

The criteria (or thresholds) for determining the significance of cumulative environmental impacts refer to the levels of acceptable cumulative change, which can be measured quantitatively or qualitatively.

27. Indicate how your agency determines whether the cumulative environmental impacts of a proposed project are significant. Please check all that apply

- State statutes determine the significance of cumulative impacts.
- Administrative rules determine the significance of cumulative impacts.
- Agency guidelines, manuals, or policy directives determine the significance of cumulative impacts.
- The entity responsible for preparing the ER document determines the significance of cumulative impacts.
- Expert opinion determines the significance of cumulative impacts.
- Mitigation measures are taken into account when determining the significance of cumulative impacts.
- Resource conditions are taken into account when determining the significance of cumulative impacts.
- My agency has one set of significance criteria that are applied to all proposed projects.
- My agency has several sets of significance criteria that vary according to the type of proposed projects.
- The significance of cumulative environmental impacts is not formally defined.
- Other, please specify: _____

28. Indicate the usefulness of the criteria that are used in your agency to determine the significance of cumulative environmental impacts. Please check only one number

Very Useful	Moderately Useful	Minimally Useful	Not Useful	Not Applicable
4	3	2	1	0

SECTION IX. ANALYTIC METHODS FOR ASSESSING CUMULATIVE IMPACTS

29. Assessments of cumulative environmental impacts can be qualitative (e.g., using opinions or judgments) or quantitative (e.g., using instruments or models). Indicate which of the following best describes the analytic methods commonly used to assess cumulative impacts in your agency. Please check only one number

Analytic methods commonly used in my agency are:	Entirely Quantitative	Mostly Quantitative	Mostly Qualitative	Entirely Qualitative	Not Applicable
	4	3	2	1	0

30. Based on your experience, indicate how often the following data gathering and analytic methods are used when assessing cumulative environmental impacts in your agency. (Descriptions of data gathering and analytic methods can be found on Page 16) Please check one number for each method

Data Gathering and Analytic Methods	Always	Often	Sometimes	Rarely	Never
Questionnaires, interviews, focus groups, or panels	5	4	3	2	1
Environmental checklist	5	4	3	2	1
Matrices	5	4	3	2	1
Networks and system diagrams	5	4	3	2	1
Modeling	5	4	3	2	1
Trends analysis	5	4	3	2	1
Overlay mapping and Geographic Information System (GIS)	5	4	3	2	1
Carrying capacity analysis	5	4	3	2	1
Ecosystem analysis	5	4	3	2	1
Other, please specify: _____	5	4	3	2	1

SECTION X. COORDINATION OF ENVIRONMENTAL REVIEW DOCUMENTS

31. Indicate the extent coordination occurs in your agency during the process of conducting an ER that assesses cumulative environmental impacts. Please check one number for each level of coordination

	Extensive Occurrence	Moderate Occurrence	Minimal Occurrence	No Occurrence
Coordination among divisions <u>within</u> my agency	4	3	2	1
Coordination between my agency and <u>other</u> state agencies	4	3	2	1
Coordination between my agency and <u>federal</u> agencies	4	3	2	1
Coordination between my agency and <u>local</u> government units	4	3	2	1

32. Indicate the extent you agree or disagree with the following statements about coordination and assessing cumulative environmental impacts. Please check one number for each statement

	Strongly Agree	Agree	Disagree	Strongly Disagree
<u>Coordination is necessary</u> among local, state, and federal agencies in my state to fully and accurately assess cumulative impacts through my agency's ER processes.	4	3	2	1
My agency has the <u>responsibility</u> to coordinate with other local, state, and federal agencies in my state when preparing an assessment of cumulative impacts.	4	3	2	1
My agency's ER process gives adequate <u>time</u> for coordinating an assessment of cumulative impacts.	4	3	2	1
My agency has adequate <u>staff</u> to coordinate an assessment of cumulative impacts.	4	3	2	1
My agency has adequate <u>technical expertise</u> to coordinate an assessment of cumulative impacts.	4	3	2	1
<u>State laws and/or agency rules</u> in my state encourage coordination among local, state and federal agencies when assessing cumulative impacts.	4	3	2	1
<u>Procedures for coordination</u> among local, state and federal agencies are clearly defined for my agency to assess cumulative impacts.	4	3	2	1

SECTION XI. BARRIERS TO ASSESSING CUMULATIVE IMPACTS

33. Indicate the extent you consider the following statements as “barriers” to addressing cumulative environmental impacts for your agency. Please check one number for each statement

	Significant Barrier	Moderate Barrier	Minimal Barrier	Not a Barrier
a. Ambiguous definition of cumulative impacts	4	3	2	1
b. Ambiguous legal requirement for assessing cumulative impacts	4	3	2	1
c. Lack of explicit procedures for assessing cumulative impacts	4	3	2	1
d. Poor understanding of appropriate geographic scales for assessing cumulative impacts	4	3	2	1
e. Poor understanding of appropriate time scales for assessing cumulative impacts	4	3	2	1
f. Poor understanding of appropriate baseline for assessing cumulative impacts	4	3	2	1
g. Lack of criteria for determining the significance of a proposed project’s cumulative impacts	4	3	2	1
h. Lack of practical analytic methods for assessing cumulative impacts	4	3	2	1
i. Lack of alternative forms of ER for assessing cumulative impacts (other than standard EAs or EISs)	4	3	2	1
j. Limited legal timeframe for preparing ER documents	4	3	2	1
k. Lack of technical expertise to assess cumulative impacts	4	3	2	1
l. No adequate agency staff to assess environmental impacts	4	3	2	1
m. Lack of recognition of the importance of assessing cumulative impacts among agency staff	4	3	2	1
n. Lack of data and information needed to assess cumulative impacts	4	3	2	1
o. Limited access to data and information to assess cumulative impacts	4	3	2	1
p. Insufficient coordination between my agency and other local, state, and federal agencies in my state	4	3	2	1
q. Businesses and industries generally do not support assessments of cumulative impacts	4	3	2	1
r. Lack of general public support for assessing cumulative impacts	4	3	2	1
s. Assessing cumulative impacts lengthens my agency’s process of undertaking, permitting, funding approving, or certifying a proposed projects	4	3	2	1
t. Other, please specify: _____	4	3	2	1

From the above list, identify (in no rank order) the top three (3) barriers to assessing cumulative impacts. Use the space on the next page for further explanation if necessary:

SECTION XII. WAYS OF IMPROVING ASSESSMENTS OF CUMULATIVE IMPACTS

34. Indicate the usefulness of the following for doing a better job of assessing cumulative environmental impacts in your agency. Please check one number for each statement

	Very Useful	Moderately Useful	Minimally Useful	Not Useful
State statutes and administrative rules are adopted to provide more explicit requirements for assessing cumulative impacts.	4	3	2	1
Agency guidelines are developed to provide more explicit guidance for assessing cumulative impacts.	4	3	2	1
Business and industry gain a better understanding and appreciation of the importance of assessing cumulative impacts.	4	3	2	1
Other state agencies become more involved in my agency's cumulative impact assessment processes.	4	3	2	1
Federal agencies become more involved in my agency's cumulative impact assessment processes.	4	3	2	1
Local government units become more involved in my agency's cumulative impact assessment processes.	4	3	2	1
Public comments on proposed projects are explicitly related to cumulative impacts.	4	3	2	1
Judicial system provides more explicit guidance on <u>when</u> to assess cumulative impacts.	4	3	2	1
Judicial system provides more explicit guidance on the <u>standards</u> for analyzing cumulative impacts and preparing a cumulative impact assessment.	4	3	2	1
Judicial system provides more explicit guidance on <u>how</u> to determine thresholds of significance of a proposed project's cumulative impacts.	4	3	2	1
Other, please specify: _____	4	3	2	1

SECTION XIII. OUTCOMES OF ASSESSING CUMULATIVE IMPACTS

35. Indicate the extent you agree or disagree with the following statements about assessments of cumulative environmental impacts. Please check one number for each statement

	Strongly Agree	Agree	Disagree	Strongly Disagree
Assessing cumulative impacts has enhanced (would enhance) my agency's ability to fully identify the environmental impacts of a proposed project.	4	3	2	1
Assessing cumulative impacts has improved (would improve) my agency's decision-making about undertaking, permitting, funding, approving, or certifying proposed projects.	4	3	2	1
The assessment of cumulative impacts has been (would be) a financial burden to businesses and industries in my state.	4	3	2	1
The assessment of cumulative impacts has been (would be) a financial burden to my agency.	4	3	2	1
The assessment of cumulative impacts has been (would be) a financial burden to local government units in my state.	4	3	2	1
The assessment of cumulative impacts has increased (would increase) the time required for my agency to permit, fund, approve, or certify proposed projects.	4	3	2	1

Section XIV. ADDITIONAL INFORMATION

36. Please share any other comments you have on your agency's ER requirements and practices and the assessment of cumulative environmental impacts:

Thank you for taking time to complete this survey!
If you are interested in the results of the survey, please check her

Please return the survey and any attached documents by August 24, 2007.

Description of Data Gathering and Analytical Methods for Assessing Cumulative Environmental Impacts

Data Gathering and Analytical Methods	Description
Questionnaires, interviews, and panels	Questionnaires, interviews, and panels are useful for gathering the wide range of information on multiple actions and resources needed to address cumulative impacts. Brainstorming sessions, interviews with knowledgeable individuals, and group consensus building activities can help identify the important cumulative impact issues in the region.
Environmental checklists	Environmental checklists help identify potential cumulative impacts by providing a list of common or likely effects and juxtaposing multiple actions and resources. They are sometimes used as a shortcut to thorough scoping and conceptualization of cumulative impacts problems.
Matrices	Matrices use the familiar tabular format to organize and quantify the interactions between human activities and resources of concern. Once even relatively complex numerical data are obtained, matrices are well-suited to combining the values in individual cells of the matrix to evaluate the cumulative impacts of multiple actions on individual resource, ecosystems, and human communities.
Network and system diagrams	Networks and system diagrams are an excellent method for delineating the cause-and-effect relationship resulting in cumulative impacts. They allow the user to analyze the multiple, subsidiary effects of various actions and trace indirect effects to resources that accumulate from direct effects on other resources.
Modeling	Modeling is a powerful technique for quantifying the cause-and-effect relationships leading to cumulative impacts, can take the form of mathematical equations describing cumulative processes such as soil erosion, or may constitute an expert system that computes the effect of various project scenarios based on a program of logical decisions.
Trends analysis	Trends analysis assesses the status of a resource, ecosystem, and human community over time and usually results in a graphical projection of past or future conditions. Changes in the occurrence or intensity of stressors over the same time period can also be determined. Trends can help the analyst identify cumulative impacts problems, establish appropriate environmental baselines, or project future cumulative impacts.
Overlay mapping and Geographic Information System (GIS)	Overlay mapping and GIS incorporate locational information into the assessment of cumulative impacts and help set the boundaries of the analysis, analyze landscape parameters, and identify areas where impacts will be the greatest. Map overlays can be based on either the accumulation of stresses in certain areas or on the suitability of each land unit for development.
Carrying capacity analysis	Carrying capacity analysis identifies thresholds (as constraints on development) and provides mechanisms to monitor the incremental use of unused capacity. Carrying capacity in the ecological context is defined as the threshold of stress below which populations and ecosystem functions can be sustained.
Ecosystem analysis	Ecosystem analysis explicitly addresses biodiversity and ecosystem sustainability. The ecosystem approach uses natural boundaries (such as watersheds and ecoregions) and applies new ecological indicators such as indices of biotic integrity and landscape pattern). Ecosystem analysis entails the broad regional perspective and holistic thinking that are required for successful assessment of cumulative impacts.

Source: Council on Environmental Quality (CEQ). 1997. Considering cumulative effects under the National Environmental Policy Act. Washington, DC: Council on Environmental Quality.

APPENDIX D
COVER LETTER FOR TIER-TWO STATES

August 7, 2007

Mr. XXXX
Address
(City), (State) (Post code)

Dear Mr. XXXX:

As indicated in our phone conversation a few days ago, a survey questionnaire is attached in this email requesting your assistance in identifying challenges and opportunities to effective assessment of environmental impacts at the state level. In cooperation with the University of Minnesota and with help from the Minnesota Pollution Control Agency, we are assessing environmental review (ER) and permitting processes for all 50 states in an effort to identify best practices, common challenges, and implementation strategies for evaluating environmental impacts, and in particular the assessment of cumulative environmental impacts. The results of our study will be provided to state agencies to assist decision making about ER and permitting processes based on the national landscape.

As you are aware, the challenges of assessing environmental impacts of development and natural resource related projects are significant and vary from state to state. Differences in experiences, agency rules, state statutes, and the natural resource base all contribute to differences in how state programs are administered and used for assessing environmental impacts. We have learned that your agency has adopted processes to assess environmental impacts of proposed projects prior to undertaking, permitting, funding, approving, or certifying such projects. As such we would like to better understand the policies, procedures, and perspectives you have for these processes.

We recognize that your time is valuable. Therefore, we have attempted to keep the length of the survey to a minimum while still addressing key issues. The survey will take approximately 25 minutes to complete. You may choose to 1) type your responses in the attached questionnaire, save the completed questionnaire as a PDF file, and email us the PDF file; or 2) print and fill out the attached questionnaire and send us the completed questionnaire by mail. If you are not able to complete the survey or feel that another individual is better suited, please forward this survey to that individual or contact us with their information. Please kindly return the completed questionnaire by **August 24, 2007**. We expect to complete this study in October 2007 and will send you our study report when it becomes available.

Thank you in advance for your time and consideration and please do not hesitate to contact us if you have questions or concerns. Zhao Ma can be reached at 612-624-4280 or by email at maxxx103@umn.edu. Dennis Becker can be reached at 612-624-7286 or by email at drbecker@umn.edu. We look forward to working with you and assisting in your efforts to effective ER and permitting processes.

Sincerely,

Zhao Ma, Ph.D. Candidate
Department of Forest Resources
University of Minnesota

Dennis Becker, Ph.D., Assistant Professor
Department of Forest Resources
University of Minnesota

Attachment (1): Survey of State Environmental Review Requirements and Practices.pdf