COPING WITH COMPLEXITY: BUREAUCRATIC DECISIONMAKING UNDER THE NATIONAL ENVIRONMENTAL POLICY ACT

By

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ABSTRACT

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The National Environmental Policy Act of 1970 mandates a decisionmaking reform by requiring an environmental impact statement for any major federal action which significantly affects the quality of the human environment. The underlying concept is that an open, public planning process would insure consideration of environmental factors in implementation. After over a decade of experience, there is no consensus about NEPA's performance. The focus of this study is on the implementation of NEPA and agency compliance.

The primary purpose of this research is to reveal whether environmental factors were included in agency decision premises in their program and project planning. An empirical investigation of 26 route location decisions by the Michigan Department of Transportation and a case study of one decision provided basis for this investigation. This study combines information from these sources to make inferences about the agency's implicit decision rule. It was assumed that an agency would simplify the decision process and rely on only a few factors to reach its decision. It was hypothesized that an agency would comply where compliance was easiest to determine, and try to retain control over most other decision

aspects.

The implementation strategy exhibited by the MDOT was to use the early planning stages to screen and reduce the final decision alternatives to a very small set of choices with little variation. There was evidence that these alternatives all met specific environmental policy requirements, while factors in the general spirit of NEPA had a weak influence. Final choices became technical questions of transportation and engineering. This placed the public at a disadvantage because participation has a history of being strong only in the later planning stages.

This is dedicated by my Parents
for their unwavering love, faith, and
encouragement.

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NEPA AND ITS IMPLEMENTING REGULATIONS

Introduction

In 1969 Congress passed the National Environmental Policy Act which has been labeled the first "comprehensive national commitment to protection of the environment" (Caldwell, 1979, 50001). In addition to providing a policy statement which recognized environmental values, Congress included a policy for implementing the substantive directives of this law. These have become known as the "action enforcing" provisions of the Act. The action enforcing provisions mandate a decisionmaking reform by requiring environmental impact statements for any major federal action which significantly affects the quality of the human environment (NEPA, Sec. 102, (2)C). In essence NEPA calls for federal agencies to follow a policy which describes how they should make decisions. The model of choice, which forms the basis of the environmental impact statement, is rational and analytical. It stresses a "systematic, interdisciplinary" approach which is akin to comprehensive planning. The underlying concept is that comprehensive planning would insure the consideration of environmental

factors along with all other variables. In this way better decisions would lead to a better environment.

After over a decade of experience with NEPA, there is no clear consensus among students of environmental policy on its success or failure (Liroff, 1980; Caldwell, 1979; Fairfax, 1978). This can be in part attributable to the fact that NEPA's goal, to encourage productive and enjoyable harmony between man and his environment, is general and ambiguous, and that performance toward reaching such a goal is difficult to measure. While many agree that NEPA's effect on the landscape is hard to assess, researchers have not failed to examine federal agency implementation of NEPA. Some recent criticism has pointed out problems in carrying out the objectives of the Act. The action enforcing provisions do not seem to be producing comprehensive decisions (Friesma and Culhane, 1976; Hill and Ortolano, 1978). Although critics have been quick to point out these inadequacies in the way agencies have complied with NEPA, few have offered any explanation for the bureaucratic behavior they have observed.

If one wants to determine whether NEPA is effective in improving the quality of the environment, and if one wants to improve the implementation of the Act, it is necessary to know and understand how its present implementation is reflected in agency decisions. The focus of this study is on the implementation of NEPA's action enforcing provisions

from the perspective of a bureaucracy which is faced with an inherently complex task. The basis of this perspective is that, when the complexity of the human environment and the limitations of human information processing capabilities are considered, the assumptions of NEPA's implementation model are unrealistic (Caldwell, 1979, 50003). A gap exists between what Federal agencies can accomplish and what is required of them by NEPA. Therefore, what is observed is the outcome of how bureaucrats cope with these unrealistic demands. The objectives of this examination of NEPA implementation are to formulate and test a model of agency decisionmaking, consistent with the concept of bureaucratic coping behavior, and to assess NEPA's impact on agency decisionmaking.

Description of the Law

The Congressional intent behind NEPA has been the subject of many articles and books. It is accepted that one key reason for a national environmental policy is to establish an umbrella policy statement for the protection of the environment. Previous legislation had taken a piecemeal approach. By establishing an umbrella policy Congress felt that it could promote the consistent and systematic application of the various pieces of environmental legislation and bolster their consideration in

administrative decisionmaking at all policy levels - legislative, program, and project. Section 102 which, among other things, calls for the preparation of environmental impact statements provides the integrating instrument to satisfy this intent.

From the recollections of staff members and the record of legislation it is reported that "the impact statement was not intended merely to provide data on description, but to force a change in the administrative decisions affecting the environment" (Dreyfus and Ingham, 1976, 254). In order to force change, the impact statement requirement brings administrative decisionmaking under the public eye. The impact statement provides a forum for public discussion and administrative explanation of how environmental issues are resolved in project decisions. The underlying incentive for bureaucratic compliance is the threat of litigation. Although it has been admitted by Congressmen and staffers that the impact of NEPA could not be predicted, the objective of NEPA is the promotion of a better environment through better decisions, meaning more comprehensive decisions. To insure better decisions, the decisionmaking process is public.

NEPA contains three components: (1) a policy statement for the environment, (2) a policy statement for how decisions affecting the environment are to be made, and (3) the establishment of a Council on Environmental Quality. All

three components make up a legislative package designed to change previous government practice which had resulted in a deleterious effect on the Nation's environment.

A Policy for the Environment

As an outgrowth of the environmental movement, NEPA recognized the importance of environmental factors which had previously been treated only in cursory fashion. Other environmental legislation left gaps in environmental protection because they failed to consider the interrelatedness of environmental affairs and how it could directly impact project decisions. NEPA is an attempt to cover these gaps with an umbrella policy and an implementation instrument which focuses on decisionmaking. In giving recognition to the impact of man on the natural environment, Congress stated in NEPA,

> ...it is the continuing policy of the Federal Government...to use all practicable means and measures...in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements present and future generations of Americans (Sec 101(a)).

In making this policy statement Congress gave standing to environmental concerns next to that of social, economic, and technological values in federal government decisionmaking. It also gave weight to the consideration for future generations in the use of the environment. Congress elaborated on these points by asking that the federal

government strive for beneficial uses of the environment "without...undesirable and unintended consequences" (Sec. 101(b)(3)). To maintain the environment for future generations, federal decisions should show a "balancing of population and resource use which permits a high standard of living through the enhancement of the quality of renewable resources and recycling of depletable resources". In addition, important historic, cultural and natural aspects of national heritage are to be preserved. Finally, there is the added objective that "an environment which supports diversity and variety of individual choice" is to be maintained. In so doing the federal government is to adopt the role of trustee for the environment.

A Policy for Decisionmaking

To work with the policy statement for the environment Congress included an implementation policy which describes how planning decisions are to be made. This second component of NEPA outlines a planning procedure for federal agencies to follow. Although Congress left the drafting of specific rules to the agencies, it established a general policy that the planning process utilize a "systematic, and interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts..." (Sec. 102(2)(A)). Methods and procedures are to be developed "which will insure that presently

unquantified environmental amenities and values may be given appropriate considerations in decisionmaking". The proof of this consideration of environmental values is exhibited in a planning report called an environmental impact statement.

Congress described in skeletal form the composition of an EIS which is to accompany federal proposals for both legislation and action. EIS's must be prepared for all "major federal actions significantly affecting the quality of the human environment" (Sec. 102(2)(C)). The EIS must include the following information:

(i) The environmental impact of the proposed action,

(ii) Any adverse environmental affects which cannot be avoided should the proposal be implemented,

(iii) Alternatives to the proposed action,

(iv) The relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and

(v) Any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented (Sec. 102(2)(C)).

The final EIS also is to include comments of other federal agencies which have jurisdiction by law or expertise with respect to the environment involved, as well as of the general public (Sec. 102(2)(C)). Although NEPA required the preparation of an EIS, the law is not clear whether this activity should be integrated into federal agency planning procedures or be separate from it. Whichever is the case,

the purpose of EIS preparation is to demonstrate federal agency consideration for environmental values in their decisionmaking.

Establishing the Council on Environmental Quality

In addition to passing a national mandate for the protection of the environment Congress provided a body to assume leadership for directing this policy. Title Two of NEPA establishes the Council on Environmental Quality in the Executive Office of the President. Its principle purpose is to advise the President and report on the state of the nation's environment. The Council's other tasks are to review and appraise federal programs with respect to NEPA policy, to recommend national policies for the quality of the environment, and to conduct studies relating to environmental quality. Finally, the CEQ is one of the designated recipients of agency EIS's.

In summary NEPA declared a national policy for the environment. This policy supported existing federal environmental legislation, and provided "all federal agencies with a mandate to weigh environmental impacts in their decisions" (Liroff, 1980, 154). In order to encourage agency compliance, Congress instituted a "series of action-forcing mechanisms". The principle mechanism is the environmental impact statement, which is required of all major federal actions significantly affecting the quality

of the human environment. The process, leading to the preparation of the EIS, has been characterized as NEPA's "internal reform" of administrative decisionmaking. Likewise, NEPA's other requirement of interagency review and public comment is an external reform which pressures administrative compliance (Liroff, 1980). Generally speaking, NEPA is designed around these two reform ideas, but whose implementation, as NEPA's early history shows, presented difficult problems in compliance.

History of NEPA's Administrative Rulemaking

With the signing of NEPA by President Nixon in 1970, not only did the United States gain an environmental policy, but it also established the Council on Environmental Quality. One of the Council's first and most important duties was the development of administrative guidelines for the implementation of NEPA. The direction and emphasis of the CEQ guidelines were a key factor in how federal agencies perceived the Act and their duties to comply with it. As the record of experience with NEPA grew, the CEQ further revised its guidelines in response to agency behavior and to judicial review. The Council was at the interface. In his analysis of the CEQ guidelines, Herbert Stevens states that the guidelines

> ...are not simply parallel to and separate from the judicial interpretation of NEPA, but are instead a kind of hybrid creation - an administrative-judicial gloss on the statutory language of NEPA. Given the advisory position of CEQ with respect to implementation of NEPA, as contrasted with the position of those mission agencies of the federal government, the Guidelines draw their strength from their consolidation of important cases under NEPA...(Wichelman, 1976, 275).

Relying on the NEPA case history where need be, the CEQ slowly and consistently tried to bring federal agency behavior in line with the spirit and goals of NEPA. The period from 1970 to 1978 shows the evolution of guidelines from being narrowly focused on the "detailed" statement to a broader concern about NEPA's integration in agency decisionmaking. In 1978 the CEQ issued Implementing Regulations for NEPA which became effective in July, 1979; these regulations were the culmination of this first period of NEPA's history. Before a detailed description of the Implementing Regulations, a brief history of the CEQ's efforts will be given in order to put the Regulations in their proper context.

NEPA's Early Guidelines

The history of NEPA's guidelines begins with Executive Order No. 11514 in 1970 in which President Nixon delegated the responsibilities given to him by the Act to the CEQ. The Executive order restated the requirements of the Act, but emphasized the timely access to information for public

review. It implied "a policy...of increased public participation before the process of recommendation, review, and approval was completed" (Andrews, 1976, 28). Second, it emphasized the preparation of the "detailed statement", required by Section 102 (2)(C). This point was stressed, while no mention was made concerning the other requirements of the Act. Andrews suggested that,

> Perhaps in part because of this emphasis, however, both CEQ and the other agencies focused from the onset almost exclusively upon the procedures for producing these statements and virtually ignored most of the law's other provision (1976, 29).

Following the lead of the Executive order "interim" guidelines were issued in April, 1970, which covered in detail only the preparation of environmental statements. These advisory rules dealt with the procedural aspects of preparation and gave little guidance on substantive compliance. This responsibility was left to the line agencies, themselves. The interim guidelines were thought to represent CEQ's policy strategy of "accommodation" rather than confrontation with other agencies, and maybe explains its lack of more specific direction (Andrews, 1976, 29). Late in 1970 a subcommittee of the House Merchant Marine and Fisheries Committee held congressional oversight hearings on the implementation of NEPA. Some problems in NEPA implementation were identified, and the Council's policies dealing with disclosure of environmental statements and

comments were criticized. As an outgrowth of these hearings the Council was forced to revise its guidelines "to require disclosure of environmental impacts a reasonable length of time before taking administrative actions" (Andrews, 1976, 33). Revised Guidelines were adopted in April, 1971.

Again, it can be said that the CEQ dwelled on the procedural aspects in the Revised guidelines. This time the emphasis was on trying to build NEPA implementation into agency decisionmaking. To meet this objective, agencies were ordered to assess environmental impacts "as early as possible, and in all cases prior to agency decision". In addition, agencies were asked to specify the review processes, and points within these processes where environmental statements would be made available. Finally, at the urgings of Congress a minimum time period for public review was established. The review period for a draft environmental statement is ninety days and it is thirty days for a final statement. In so doing the CEQ tried to bring environmental policy to a forefront position in agency decisionmaking, as well as to alert interests outside the agency to the proposed action.

The Guidelines were revised again in August, 1973. During the intervening period, the CEQ drafted a series of memoranda which continued their attempt to improve implementation through more detailed procedures, and the growing legal history. The CEQ was consistent in moving toward

procedures which integrated environmental policy into agency decisionmaking and new emphasis was placed on the other requirements of the Act. Stressing NEPA's specific policy objectives, the Revised Guidelines strengthened the concept that agencies should utilize in systematic fashion the natural and social sciences in their planning and decisions; that environmental assessments should be conducted at the same time as technical and economic studies; that where competing factors, which are balanced with environmental impacts, are involved in the overall decision, they are to be mentioned within the environmental statement. This last requirement broadened the idea of the detailed statement beyond that of an objective, factual declaration. As Andrews points out, "the language of NEPA required both an objective declaration and evaluative judgment about the merits of what was declared: a detailed statement not only of the impacts and alternatives per se, but also of the "adverse effects" of a "proposed action" (1976, 37)". In so doing, the Council expanded the scope of the environmental statement to include more of an agency's decision calculus, which likewise brought more information of agency decision-making under public review.

The Revised Guidelines of 1973 remained in effect until final regulations were issued in July, 1979. These final regulations were the result of an eighteen month rulemaking process which was initiated by President Carter's Executive

Order No. 11991. This order directed the Council "to reform the NEPA process so as to reduce paperwork and make the statutorily required environmental analysis more useful to Federal decision-makers and the public" (Environmental Law Reporter, 1979, 10005). In large part the Executive order was another response to problems which arose in NEPA's implementation history. Most of the NEPA related litigation was due to agency noncompliance with environmental statement preparation or inadequate preparation. Once the question of which agency decisions require statements was resolved, adequacy and actual utilization of EIS information in agency decisions were the chief concerns of the CEQ.

While the success or failure of NEPA in influencing agency decisions has been near impossible to determine, some are of the opinion that:

> The assumption that environmental quality could be enhanced simply by increasing information and agency disclosure, however, has proved fallacious. Change in type and amount of information available, without a corresponding change in the manner in which it is evaluated and used, simply has not had significant influence on agency action (Yale Law Journal, 1979, 599).

Those critics who adopt this view argue that up until 1979 the environmental statement was just a procedural tool, and that there was nothing to influence agencies to alter their mission orientation. For others, NEPA's performance was a gray area. Certain case studies have shown NEPA to be a determining influence, but for the most part, NEPA's

impact on the federal bureaucracy was seen to be gradual and modest through procedural innovation (Wichelman, 1976, 263-300). The evidence of NEPA success, that is cited by policy analysts, is usually in terms of project delays, public controversy, and litigation. While modest changes in agency decisions can be attributed to the reasons cited above and other factors internal to an agency, such as new personnel, special offices, and compatible agency missions, it seems as though there was an absence of a strong link between environmental information, generated by the NEPA requirement, and the design of agency action early in the planning process. A CEQ study of the first six years of NEPA found that many decisions on the design of alternative choices were based on formal and informal assessments before an EIS was prepared (CEQ, 1976). This absence was compounded by a lack of any follow-up review or monitoring of the implemented action with respect to the predicted impacts in the environmental statement. Although there was no conclusive evidence on the impact of NEPA on agency decisions, the impression that was left by assessments of the law's implementation was that the process of EIS preparation was not integrated into agency planning, and therefore remained less effective in bringing about NEPA's substantive goals.

NEPA Implementing Regulations

In trying to improve on the shortcomings of the Revised Guidelines of 1973 which focused only on Section 102(2)(C) of the Act, the CEQ issued Regulations in 1978 which had a broader application of NEPA's procedural requirements. The new CEQ Regulations became effective on July 30, 1979. Their stated purpose was to make the process more useful through the reduction of paperwork, avoiding unnecessary delays, and reaching better decisions. The CEQ Regulations attempted to respond to the criticism of NEPA implementation. There were three major changes in the new CEQ Regulations. First, the Regulations were made binding on all federal agencies. Previously, the Guidelines were only advisory; now one set of standards is established. Second, the Regulations apply NEPA policy to a wider range of agency decision activities than just EIS preparation. The NEPA policy extended from early planning through post-decision reporting. Last, for simplicity and clarity federal agencies are required to use a standard terminology and format, as well as follow standard procedures (McDermott, 1979, 92-9). Standardization allows administrative participants to know the schedule of events, and reviewers to oversee the decision process. By formulating these three changes, the CEQ continued to strengthen its commitment to the spirit of NEPA which calls for a systematic, interdisciplinary planning and decisionmaking approach.

Regulations for Implementing NEPA: A Description

The CEQ Regulations are described in order of the decisionmaking events of the NEPA process, but it should be recognized that the process is flexible and allows for planning adjustments in response to changing situations. The Regulations can be divided into five stages: (1) early planning, (2) draft EIS preparation, (3) review and final EIS preparation, (4) record of decision, and (5) monitoring implementation of the decision. They are discussed in that order.

Early Planning

One of the stated purposees of CEQ's new regulations is to "insure appropriate consideration of NEPA's policies" in agency decisionmaking. To accomplish this purpose and also to reduce paperwork and time delays in the decision process a number of early planning or pre-EIS activities are performed. Once an agency has a proposed project it must determine whether an EIS is necessary. The decision to prepare an EIS can be made in two ways: (1) by classification of projects which normally require EIS's, and (2) by preparation of an environmental assessment (EA). Implicit in both methods is the determination of what is a "major federal action", what are "significant affects" on the environment, and what is considered the "human environment". Some

guidance in defining these forms is offered, but leave the specifics to the particular agencies. The definitions do not eliminate ambiguity.

If the proposed action "normally" requires an EIS, the decision to prepare an EIS is simple. On the other hand, if the proposed action does not fall in regular procedural categories, the federal agency prepares an environmental assessment (EA). An EA is a public document that serves to discuss the need for the proposal, the alternatives to be considered, and the environmental impacts. It is produced with the consultation of other appropriate agencies. The result of preparing an EA is to determine the need for an EIS. If it is found that an EIS is not necessary by means of categorization or by preparing an EA, the agency drafts a "finding of no significant impact". Where an EIS is required, the process of "scoping" is commenced.

With the start of the "scoping" process a lead agency is designated, as well as cooperating agencies for the project. The lead agency assumes the primary responsibility for preparing the EIS. The scoping process is an early planning step. This process begins with the invitation to "affected federal, state, local,...and other interested persons" to participate (40 CFR 1501.7). This procedure tries to answer questions of who should be involved in the process, what issues should be discussed in the EIS, how should the EIS be prepared, and when will NEPA process and related decisions

be made. It is also possible for revisions to answers to these questions to be made if changes are offered in the proposed action. The project of the scoping process is a plan of action for the preparation of the EIS and its use. This plan should indicate the responsibilities of the lead agency and cooperating agencies. It should also show how this NEPA process activity fits with other proposals and existing projects. Finally, all requirements for review and consultation should be identified and analyses planned for meeting them.

As a result, the scoping process can reduce paperwork by avoiding extraneous material, involve interested parties early in the process, and reach better decisions through greater participation in the review procedure (McDermott, 1979, 103).

EIS Preparation

The CEQ Regulations specify the form and contents of environmental impact statements. Consistent with the spirit of NEPA, one of the main purposes for preparing an EIS is to:

> ...provide full and fair discussion of significant environmental impacts and shall inform decision-makers and the public of the reasonable alternatives which would avoid or minimize adverse impacts or enhance the quality of the human environment (40 CFR 1502.1).

The boundaries of this discussion are set during the scoping process. EIS preparation is to provide the

information and analyses on which the discussion is to be supported. The regulations stress, as an end purpose of the EIS, that it will be used by federal officials "...to plan actions and make decisions" (40 CFR 1502.1). Thus, the EIS is an integral part of the NEPA decision-process because it is a platform for discussion of pertinent issues to the decision at hand, as well as a subject of review and criticism.

Agencies first prepare a Draft EIS according to the plan which is developed in the scoping process. The Draft EIS is circulated for review and comment to other agencies and the public. A Final EIS is written which includes responses and alterations as raised in comments and criticisms on the Draft EIS.

The outline of an environmental impact statement is general. Its major sections are: (a) purpose and need, (b) alternatives, including the proposed action, (c) affected environment, and (d) environmental consequences (40 CFR 1502). "Purpose and need" is a brief explanation of the problem to which the agency is responding in its proposal. The Regulations call the "alternatives" section the "heart of the EIS" because it describes the alternatives under consideration and their impacts in comparative form. It should be written "...sharply defining issues and providing a clear basis for choice among options by the decisionmaker and the public". The information and analyses

for comparing alternatives comes from the remaining two major sections. The third section described the environment of the areas to be affected or created by the proposed action. Finally, "environmental consequences" section forms the scientific basis for impact determination and alternative comparison. The nature of the impacts discussed in this section are outlined in Section 102(2) C of NEPA while the new Regulations specify that the scope shall include:

(a) Direct effects and their consequences.

(b) Indirect effects and their significance.

(c) Possible conflicts between the proposed action and the objectives of federal, regional, state and local...land use plans, policies and controls for the area concerned.

(d) The environmental effects of alternatives including the proposed action.

(e) Energy requirements and conservation potential of various alternatives and mitigation measures.

(f) Natural or depletable resource requirements and conservation potential of various alternatives and mitigation measures.

(g) Urban quality, historic and cultural resources, and the design of the built environment...

(h) Means to mitigate adverse environmental impacts (40 CFR 1502.16).

As an examination of this list shows the NEPA requirements are an attempt to be comprehensive. The scoping process of early planning should have narrowed the bounds

of this discussion and investigation, as well as identified what will be emphasized. These four sections make up the body of the EIS document. In addition to these sections, the EIS is rounded out by a summary statement, list of preparers, list of agencies, organizations, and persons to whom copies are sent, and appendices.

The CEQ Regulations also offer some guidance for certain situations which can be faced by preparers of an EIS. First, an EIS need not duplicate the discussion of a higher level (broader) EIS which has already been prepared. "Tiering" is acceptable. The lower level EIS need only summarize the higher level EIS discussion. Second, when relevant information is lacking or uncertainty exists, the agency shall acknowledge this point. If the needed information is essential and the costs of obtaining it "are not exorbitant", the agency shall include it. On the other hand, if the costs are exorbitant or the means of securing the information are unknown,

> ...the agency shall weigh the need for action against the risk and severity of possible adverse impacts were the action to proceed in the face of uncertainty. If the agency proceeds, it shall include a worst case analysis and an indication of the probability or improbability of its occurrence (40 CFR 1502.22).

Third, the EIS must contain explicit references to the sources which are relied upon with respect to scientific methodology and accuracy. Fourth, while the NEPA process

does not require it, cost-benefit analysis can be incorporated in the statement by reference or appended. If it is prepared, the regulations ask that there is a discussion of the relationship between the cost-benefit analysis and any analyses of unquantified environmental impacts.

Review and Comment

The Draft EIS is the first substantive document of the NEPA process that is subject to outside agency review. The purpose of the Draft EIS is to help garner comments about the lead agency's proposal for action. The lead agency must obtain comments from any federal agency which has jurisdiction by law, or expertise to any environmental impact involved (40 CFR 1503); and it is the duty of these agencies to comment. Likewise, it can request comments from state and local agencies and the public. The Regulations ask that the comments be specific and offer alternative approaches to the ones that are criticized. Thus, it becomes a requirement of both the lead agency and reviewing agencies to participate actively in the NEPA process.

The preparation of the Final EIS begins once all comments on the Draft EIS are received. All the comments are assessed by the agency and a response in the Final EIS is made. Responses can be made in a number of different ways. They range from developing and evaluating new alternatives to explaining why certain comments do not

warrant any further agency response. After consideration and responses are given to the comments generated by the Draft EIS, the Final EIS, which includes these responses, is circulated in the same way as the Draft. Either through agency review or other contact, interagency disagreement is always possible. In such a case where an agency finds the proposed activity is "unsatisfactory from the standpoint of public health, welfare, or environmental quality" and resolution of this conflict with the lead agency can not be reached, referral is made to the Council of Environmental Quality. The Council takes authority to bring this situation to resolution (40 CFR 1504).

Record of Decision

In the early guidelines there were no provisions for the utilization of EIS's in agency decisionmaking. The new regulations expand to include decisionmaking and implementation. They explicitly state that agencies shall follow procedures to make decisions in accordance with NEPA and by requiring that:

> ...relevant environmental documents, comments, and responses accompany the proposal through existing agency review processes...
> ..The alternatives considered by the decision-maker are encompassed by the range of alternatives discussed in the relevant environmental documents and...alternatives described in the environment impact statement (40 CFR 1505.1).

Upon making a decision the agency prepares a record of decision. The record of decision states the outcome of the

decision process. In addition the agency must communicate the alternatives which were considered, and which one is environmentally preferable. The agency shall:

> ...identify and discuss all such factors... which were balanced by the agency in making its decision and state how those considerations entered into its decision (40 CFR 1505.2).

While the Regulations do not require that the agency select the environmentally preferable alternative, it has to explain why this course of action was not chosen if another option was selected (McDermott, 1979, 107). A statement in the record of decision must also be made to demonstrate that an attempt was made to minimize harm to the environment in the selected alternative.

In order to follow through with mitigation measures and other conditions proposed in the EIS the Regulations demand that a "monitoring and enforcement program be adopted and summarized" as part of the public record. The lead agency is supposed to impose "appropriate conditions in grants, permit, or other approvals" (40 CFR 1505.3) to assure implementation according to the plan.

In summary, the record of decision is an attempt to bring agencies to show how the EIS is used in their decisionmaking, and it is a document to which they can be held accountable in post-decisions actions.

The history of the CEQ Regulations shows the evolution of the formal operating procedures for implementing NEPA.

The direction of this evolution was to bring more and more of federal agency planning and decisionmaking, which affected the environment, into the public domain in order to force the integration and utilization of NEPA policy in that process. The major implementing innovation for this policy is the EIS; the EIS is strengthened by the requirement of another innovation, the "record of decision". In addition to these required decision documents the Regulations stressed consideration of NEPA policy early in the planning process to influence the design and analyses of alternative choices. Altogether the history of the Regulations demonstrates a clear movement by the CEQ to incorporate NEPA into every stage of federal bureaucratic planning and decisionmaking.

Conclusion

What can be gleaned from the history and criticism of federal agency compliance with NEPA is that agency planning and decisionmaking has been perceived by environmentalists to have fallen short of expectations. This perception may have been based on the public's and court's interpretation of NEPA's requirements as a demand for a comprehensive planning process and for the EIS to serve as evidence of compliance. This is consistent with one of the underlying concepts of NEPA - that decisionmaking would consider

environment factors in the decision calculus, and this would result in better decisions and in a better environment. While there is no consensus on what constitutes better decisions or a better environment, critics have pointed out, and it can readily be observed by reading an EIS, that the results of agency planning under NEPA are seemingly short-sighted. Criticism has been leveled at both the substantive inadequacies of EIS's and the procedural failures of some agencies in preparing them in a comprehensive and integrated fashion. Thus, the implementation strategy of the Act, of internal reform of decisionmaking and external oversight, is not producing the results as effectively as drafters and environmentalists had hoped.

One of the reasons that has been offered to explain part of NEPA's unimpressive performance is that the assumptions of the decisionmaking model are too hard to meet in dealing with problems with environmental complexity. Agencies like individuals have limited capacities and resources to process all the necessary information for reaching optimal decisions. Thus, no matter how effective the decision strategy is, the result will be by definition suboptimal. Any agency, which must adhere to NEPA, confronts this implementation dilemma - federal agencies are under pressure to comply with NEPA while it is impossible to do so.

From over a decade of experience with NEPA one can see that the federal bureaucracy has responded to the

difficulties brought about by this dilemma. As the history of NEPA guidelines and regulations show, the CEQ has gone through an iterative process of incrementally revising administrative procedures. Each iteration had two purposes: (1) to reduce ambiguity, and (2) expand guidelines to include more of NEPA's policy - to show links between pre-decision planning and the decision stage. By the last revision in 1978 the NEPA Regulations fully specified the decisionmaking process from initiating a study to evaluation of the resulting project implementation. In spite of these revised rules and also a decade of litigation in the court system, the model of choice is still the same, but it is tempered by the "rule of reasonableness". While this may have lessened the real demands of the decisionmaking assumptions of the Act, it has not eliminated the complexity and ambiguity inherent in planning with the environment in mind.

Some critics feel that there are better policy instruments to promote a national environmental policy; more powerful regulations, allow the court system to determine policy, and others (Fairfax, 1978). While the debate continues about the benefits and costs of NEPA's performance, there has been little attempt to explain the results of NEPA policy in terms of agency decisionmaking behavior - to examine the decisions themselves.

The implementation dilemma, imposed by NEPA, presents agencies with an impossible task. This raises important questions: how have agencies responded, and what are the policy consequences of NEPA's mandate? The impossibility of compliance with NEPA pushes agencies beyond simple rule following to developing strategies to deal with the conflicting pressures faced during implementation. Agencies can be expected to develop strategies which promote organizational stability and their ultimate survival (Bartlett, 1973). Thus these strategies become significant determinants of the overall success or failure of NEPA.

The research, which addresses these questions of policy implementation of NEPA, is developed in the following chapters. Chapter Two defines the research problem involved in studying bureaucratic coping behavior, and outlines the theoretical foundation for model development. Chapter Three describes the planning procedures of the Michigan Department of Transportation, and their decision process under NEPA for highway route location projects. This example of MDOT planning and decisionmaking provides an empirical base from which a model of agency decisionmaking can be tested. The data, collected from MDOT documents, concerns highway route location decisions which are subject to NEPA requirements to qualify for federal funding. Chapter Four discusses the results of the hypothesized decision model with respect to predictability and compliance with the spirit of NEPA.

Chapter Five is a case study of one controversial highway route location project. The planning and decision process of the MDOT on this one case is followed from beginning to end from the perspective of the agency's planners and engineers. This case study provides a description of the bureaucratic environment within which decisions are made, and a foundation for the assumptions of the empirical model. Finally, Chapter Six draws on the case study and empirical model results to make a statement about compliance in the NEPA era.

CHAPTER TWO

RESEARCH PROBLEM

Decision Context

The guiding purpose of this study is to add to our understanding of agency performance in situations which require compliance with the National Environmental Policy Act. While assessing the impact of the Act on the state of the national environment may be an insurmountable task, describing its impact on decisionmaking and the response of the agencies may not be. This study is concerned with NEPA's implementation policy for decisionmaking reform, and its consequences for substantive policy. This study would like to make statements about how decisions are made by implementing agencies, and about how environmental variables are used in planning and decisionmaking. The research task is to formulate and test a positive model of agency performance in the implementation of NEPA.

To simplify this research task, the decisionmaking environment must be focused, and its characteristics described. This study will be based on one particular planning and decisionmaking setting, which has characteristics that are typical of the agencies which face the impossibility of complying with NEPA.

Level and Type of Decision

As a national policy for the environment, NEPA applies its mandate on all departments and at all levels of federal activity which may significantly effect the environment. This study focuses on planning and decisionmaking which takes place at the project level. The project level decision is below program level decisions and above operational decisions which implement a project. This is a choice between competing alternative solutions to an agency problem. Alternative solutions are the product of an agency's planning process. Each solution is a program of action which is designed to bring about a desired effect. In cases where NEPA applies, these solutions have impacts on the human environment in addition to the desired effect. The project level decision is the last planning decision before an agency implements a course of action.

Project level decisions are selected for this study for a number of reasons. The first reason for studying them is that these decisions have a direct impact on the physical environment, and they represent the final policy outcomes for which NEPA was designed to influence. A second reason is that they are, more or less, independent of the confounding influence of factors other than the consideration of alternative solutions (i.e. independent of the choice of which projects to pursue). Thus, project decisions by their level and independence can be used to demonstrate how NEPA

is integrated in the decision calculus of federal agencies.

While a project level decision is not irreversible, it represents a commitment on the part of an agency to a specific course of action which will have an impact on people, property and the state of the environment. A project decision is perceived separate from higher level policy and program decisions, and usually receives a different public response. Project level decisions consider more specific courses of action. Likewise, consequences and impacts of action alternatives are more explicitly described. The greater detailed nature of agency planning information makes it easier for critics and outside parties to trace the agency planning effort, and more importantly, to perceive potential benefits and costs of project actions. NEPA strengthens public, as well as interagency access to project planning information. Public informational meetings, public hearings, and EIS's give those outside the agency the opportunity to follow and contribute to agency planning and decisionmaking. This heightens the visibility of the project decision process to the public at large, and especially those parties that are likely to be affected by the project decision.

This greater visibility and opportunity for comment and criticism, while designed as an incentive for government agency compliance with NEPA, makes most project level decisions the center of controversy. While controversial

issues are raised at all levels of decisionmaking, those raised at the project level, usually concern, in addition to general questions of policy, specific aspects of planning decisions. These are brought up by local group interests and from a variety of individual perspectives. Each, it can be assumed, is concerned about ones own self-interest. As a result, the project level decision process is closely scrutinized. This public pressure on the project sponsoring agency not only inhibits it from ignoring its mandate to plan comprehensively, but makes avoiding controversy almost impossible. The project level decision has to be made in a situation of inherent conflict (West, 1984, 341). Thus, the agency must adopt a strategy in its planning and decision-making which tries to minimize controversy and maximize its planning goals. This provides a third reason to study project level decisions; that is, a project level decision is highly visible to special interests, and the decision maker is held publicly accountable. Thus, what one observes is a choice at the interface of an agency and the public sphere.

Decisionmaker

Project decisions are made by federal officials with the power delegated to them by their department head. In cases where the sponsoring body is not a federal agency (i.e. state and local government agencies), project decisions

are made by the appropriate decision body with the understanding that federal approval would be forthcoming. Here, there is usually a close working relationship between the federal funding agency and the project sponsor. The federal agency assists the sponsor in following federal administrative guidelines and qualifying for funding. Whichever is the project sponsoring body, the decisionmaker is an agency head official. An agency official must rely on a planning staff to carry out the planning tasks leading up to the project decision. Given the magnitude and complexity of most project decisions, a planning staff makes numerous planning decisions. It shapes the alternative choices and the estimates of their consequences which are considered in the final decision. The attitudes, preferences, and beliefs of those making these planning decisions influence the way problems are solved.

At the same time, the structure of an agency's organization imposes some degree of control over the operations of a planning staff to coincide with the wishes of the decisionmaker(s). It would be difficult to separate these two influences and how they contribute to the final decision without extensive interviews of all the individuals involved. This approach has been tried by other researchers in an attempt to reconstruct decision situations and to identify determinants of organization behavior (Roberts and Bluhm, 1981). For the purpose of this investigation, the organization, an agency, will be treated as the decisionmaker. The

project decision is viewed as the product of an agency effort. In order to make this assumption, this study further assumes the agency structure is stable, or any change is slow and incremental.

Decisionmaking

The determinants of agency behavior are grounded in the theoretic principles of how humans make decisions. It is assumed that an agency acts in a rational way in seeking its goals. Planning and implementing projects meet this purpose. Project implementation, in the cases which will be examined here, require approval that is subject to compliance with NEPA. One, therefore, expects an agency to attempt to comply with NEPA in the best way it knows how in the process of meeting its goals. This means that an agency simplifies the decision task into a manageable process, and it simplifies based on its perception of the political situation it finds itself in. The agency defines its situation in terms of its survival (Downs, 1967; Niskanen, 1971; Bartlett, 1973).

The project decision is made from the information generated by an agency's planning process. It tries to determine the costs and benefits of each alternative solution under consideration. While an agency may consider as many factors as it feels necessary for it to make a project decision, NEPA requires that it consider environmental

factors along with social, economic, and technical factors. The NEPA guidelines and regulations have identified the content of these sets of factors; it also asks that they be comparable. NEPA also requires that all information used to make a decision be reported. This includes other supporting documents, along with an EIS. In order to meet these requirements an agency needs to translate its goals and knowledge of the human environment into operational terms for reporting and decisionmaking. It is further assumed that a correspondence exists between an agency's general statements and its operational terms. Finally, given that agencies are rational actors, it is expected that a relationship exists between the project decision and characteristics of the selected alternative.

The decision and decision documents are the outgrowth of agency planning and reflect agency policy. More importantly, this set of information demonstrates how an agency coped with the complex tasks of planning and complying with NEPA. The word "coped" is used here to emphasize the point that an agency faced difficult tasks in completing its decision process. It is confronted with a complex problem, and it has limited capacity and resources to allocate to find the best solution. As Roberts and Bluhm point out, "Reality is unpredictable: most actions do not have exactly foreseeable consequences." This is due in part to the inherent "randomness" involved in the behavior of social

and natural systems, and to "our ignorance of the world" (Roberts and Bluhm, 1981, 18). Imperfect knowledge of the real world impairs the human decisionmaker's ability to locate the set of all possible alternative solutions to a problem. Similarly, man's limited capacity to process information is dwarfed by "the full range of conceivable relevant consequences of most decisions" (Roberts and Bluhm, 1981), and by the enormous number of calculations necessary to determine the shape and magnitude of these consequences. Herbert Simon has aptly described this human decisionmaking predicament as the principle of bounded rationality:

> The capacity of the human mind for formulating and solving complex problems is very small compared with the size of the problems whose solution is required for objectively rational behavior in the real world - or even for a reasonable approximation to such behavior (1957, 198).

The circumstances of complexity and limitations in information processing hinder the human decisionmaker from reaching the requirements assumed by classical rational behavior. In the case presented here, an agency, faced with a complex problem, copes; that is, it adopts a strategy against complexity which dictates how it allocates its decision capacity and resources, and how it selects a solution. If one wants to predict the outcome of agency behavior, one needs to understand that nature of its coping strategy in light of theories which take the limitations of

the decisionmaker and the complexity of the problem into account. This situation is better described by Simon:

> The classical theory is a theory of man choosing among fixed and known alternatives, to each of which is attached known consequences. But when perception and cognition intervene between the decisionmaker and his objective environment, this model no longer proves adequate. We need a description of the choice process that recognizes that alternatives are not given but must be sought; and a description that takes into account the arduous task of determining what consequences will follow on each alternative (Simon, 1959, 272).

Understanding agency behavior is enhanced by a model of man which considers human limitations in processes of search, computation, and choice.

Despite the complexity of the problem situation, a project sponsoring agency carries out a planning process and makes a decision. How does an agency come to terms with complex problems? This study adopts the position that an agency develops a strategy, which is consistent with the principle of bounded rationality, for coping with the impossibility of NEPA, and which is shaped by the political arena of the agency. In the following discussion a description of boundedly rational behavior and a description of bureaucratic politics are presented.

Boundedly Rational Decisionmaking

In addressing his criticism at the rational actor model of decisionmaking, Herbert Simon set the stage for a modified rational model of man. His approach concerns itself with how man operates in decisionmaking, rather than how he should. As a consequence of the principle of bounded rationality a decisionmaker is required to simplify the real decision situation in order to deal with it. In so doing Simon introduced the notion of a "real life decision":

> A real life decision involves some goals or values, some facts about the environment, and some inferences drawn from the values and facts. The goals and values may be simple or complex, consistent or contradictory; the facts may be real or suppressed, based on observation or on reports of others; the inferences may be valid or spurious. The whole process may be viewed, metaphorically, as a process of "reasoning," where the values and facts serve as premises, and the decision that is finally reached is inferred from these premises (Simon, 1959, 273).

A real life decision is a broader everyday sense of rationality, which includes more than calculating the results of a given set of alternatives. This broader concept is equally concerned with the process of reasoning. The process of reasoning can be characterized by the cognitive structure of the decisionmaker, the formulation and content of the decision premises, and the logic of the inference process (Ostrom and Job, 1982, 16). This characterization of the problem is managed, and choice simplified by the

human decisionmaker consistent with his limitations.

Cognitive Structure

One of the conditions of operating under the principle of bounded rationality is that alternative solutions are not given. They must be sought. Thus, how a decisionmaker perceives his environment and goes about simplifying it take on important meanings in understanding decision behavior and in the quality of the decision. To begin with, Simon states that decisions tend to be made in terms of the highest goals that are operative:

> The operative goals provide the seed around which the (decisionmaker's) simplified model of the world crystallizes. He takes into account those matters that are reasonably directly related to these goals and discounts or ignores others (1976, XXXV).

The decisionmaker exercises selective perception; he collects a limited amount of information with a minimum of depth.

A project sponsoring agency establishes lines of investigation and communication consistent with its selective perception. These channels of information bring particular pieces of the decision problem to the agency's attention, while shielding it from others. The complexity that still gets through to the agency by way of these selective channels is analyzed only partially and incompletely (Simon, 1976, xxxv). Selective perception supplies the input which undergoes the process of simplification. The agency, as decisionmaker, realizes that the world is made of "more stuff" than

it perceives, but it is,

> ...content with this gross simplification because (it) believes that the real world is mostly empty - that most of the facts of the real world have no great relevance to any particular situation (it) is facing and that most significant chains of causes and consequences are short and simple (Simon, 1976, xxix-xxx).

The process of simplification, as mentioned above, involves representing the decision problem in very general terms that are an incomplete accounting of the real world. In addition, the decisionmaker uses and monitors only a small and relatively fixed number of factors. The choice of which factors are utilized is determined by the experience, knowledge, goals, and outside pressures of the decisionmaking agency. In an agency working under NEPA, administrative regulations spell out a general set of factors, while outside interest groups may mention those and pin-point others of a more specific nature. At a bare minimum, the agency must report on those cited in the law, but the principle of bounded rationality would lead one to believe that factors actually vigilantly monitored are fewer in number. Through simplification, an agency tries to eliminate, as much as possible, any inherent variety in the problem situation (Steinbrunner, 1974, 56), and maintain a stable cognitive structure which conditions project decisions.

Decision Premises

A decisionmaker's cognitive structure provides a way to avoid or reduce the complexity of the problem situation, and lessens the amount of resources used to gather information. It also offers a clue to the form of decision premises. They are composed of a small set of essential variables that are measured in a simple way. The decisionmaker monitors only this set of variables until, for some reason, action taken in response to these variables fails consistently. These variables are the factors that influence the decisionmaker's evaluation of the problem at hand.

Simon identifies two types of premises that underlie decision behavior. They are factual, and value premises. In organizations, one is also concerned with the concept of a role, and the premises that make it up. Knowing a decisionmaker's premises is almost tantamount to predicting behavior.

Before hypothesizing the content of decision premises, this study looks to NEPA and its guidelines for decision premises, and evaluates their congruence with the principle of bounded rationality. In theory, Congress, by enacting NEPA, tries to control decisionmaker behavior by specifying the decision premises for federal agencies. This discussion proceeds by reporting what NEPA offers with respect to factual and value premises.

Factual Premises. NEPA Regulations, "Part 1505 - NEPA and Agency Decisionmaking," instruct agencies to adopt procedures to ensure that decisions are made in accordance with the Act. These procedures shall designate, "the major decision points for the agency's principal programs likely to have a significant effect on the human environment and assuring that the NEPA process corresponds with them" (40 CFR 1505.1 (b)). The two important phrases are "significant effect" and "human environment." The Regulations define the human environment to be:

> ...interpreted comprehensively to include the natural and physical environment and the relationship of people with that environment ...When an environmental impact statement is prepared and economic or social and natural or physical environmental effects are interrelated, then the environmental impact statement will discuss all of these effects on the human environment (40 CFR 1508.4)

While the Regulations are written in very general terms the environment it speaks of is grossly characterized by natural physical, social, and economic features. Agencies, who make project decisions, are interested in changing the state of the human environment to a better position. Subsequently, their concern is with the outcomes or "effects" of project choices. Parties, outside of these agencies, are likewise interested in project "effects" for different reasons; on how project outcomes alter their welfare.

Project effects add a second dimension to the environmental features. The Regulations state that "effects" is used synonymously with impacts. There are two categories of effects: (1) direct - caused by the action and occur at the same time and place, and (2) indirect - caused by the action and are later in time or farther removed from the action not only by physical distance, but by distance in the chain of interactions. Effects can be beneficial or detrimental. Thus, the factual premises of the project sponsoring agency structure information about the problem environment in terms of natural (biological), physical, social, and economic systems, and whether the project action will have direct or indirect effects on each system.

From what has already been mentioned about cognitive structure and human limitations, these factual premises present a fairly large set of information requirements to the decisionmaker, more likely a rational actor model. The NEPA Regulations identify fairly general premises, and instruct the agencies, themselves, to construct specific procedures to articulate the factual premises in more operational terms, geared to their particular missions.

This study assumes that the essential variables are among those for which information is gathered and reported in environmental impact statements and in subsequent reports which include EIS results. Information is reported on a number of factors. These factors are operationalizations

of the effects or impacts on the physical, biological, and social systems which characterize the environment. It is expected that an agency focuses on only a few factors which are perceived to be important impacts.

Value Premises. While factual premises established the nature of the information a decisionmaker collects and previews, value premises are necessary in order that this information can be compared and evaluated. Again, if one looks to NEPA and its implementing regulations for guidance on value premises, one finds that an agency shall:

> Identify and develop methods and procedures ...which will insure that presently unquantified environmental amenities and values may be given appropriate consideration in decisionmaking along with economic and technical considerations; (Sec. 102. (2)(B)).

The law does little to reduce the ambiguity about how values should be incorporated in the decision process, but points out that environmental factors (meaning natural and physical) should be raised to be on a par with other considerations. It should be remembered that NEPA was proposed as a decisionmaker reform. Although the Regulations are ambiguous on this point, it tries to alter agency value premises which historically adopt a mission orientation.

A review of NEPA and NEPA Implementing Regulations does not reveal fact and value premises in a form conducive to easy agency utilization. NEPA does not clarify how an agency is expected to comply with the law. The factual premises

that can be garnered from the law run the gamut of possible areas, i.e., natural, social, economic, and built environment, in terms of both direct and indirect effects. In other words, something must be said about any perceivable impact. Likewise, NEPA provides little guidance on the equally crucial value premises. NEPA demands only the consideration of environmental factors with other factors. For an implementing agency this can be interpreted to mean equal effort of investigation of environmental impacts with other impacts.

The Implementing Regulations of 1978 try to narrow the focus of the factual premises procedurally. This is accomplished through the "scoping process," which is described in Chapter One. The success of the scoping process is dependent on the assumption that the participants in the process have some notion of the spirit of NEPA and some idea of how to decompose the decision situation consistent with the spirit of NEPA and the mission of the project sponsoring agency. Clearing the ambiguity of the value premises is in the hands of the project sponsoring agency and the EIS reviewers.

Role. A federal agency is part of the government structure; it is appropriate, then, to picture it in an organizational context. An agency's behavior is influenced by the organizational environment. The nature of this influence has been incorporated by administrative theorists

in the concept of "role." Each agency of the federal government has a role that has been designed in legislation and executive orders. A role is an organization's way to evoke particular or desirable behavior from its members. "A role must be understood not as a specific, stereotyped set of behaviors but as a program...For determining the courses of action to be taken over the range of circumstances that arise" (Simon, 1976, 269). It specifies some of the fact and value premises which are used by an agency to make its decisions. As it has already been pointed out, NEPA introduces and establishes a new set of decision premises from those previously held by federal agencies. By definition NEPA altered federal agency roles to reflect the national environmental policy mandate. Thus, all federal agencies and "designated" agencies operate with fact and value premises, and a particular agency in the federal structure will hold the same premises over time.

From the perspective of this study, the concept of "role" brings with it the characteristic of stability to understanding agency behavior. By assuming that an agency adopts, one can expect the agency to respond to similar situations of complexity in the same manner. Further, one expects the agency to use only those factors that are considered essential. Finally, the relative importance of these essential variables will remain constant. As a result of assuming an agency maintains its role, any

differences that one might ascribe to personality changes in an agency are, in fact, a result of differences in the perceived environment (Ostrom and Job, 1982, 23-24). Thus, agencies play a role in the structure of government which leads to the expectation that they are relatively stable over time. How agencies perceive their role and the premises defining that role depend on their relationship with the political environment.

Decisionmaking Logic

The "process of reasoning" is culminated by the selection of a course of action from a set of alternative solutions. With consideration given to the complexity of the decision problem and his own limitations, the decisionmaker makes a choice. Operating according to the principle of bounded rationality, the decisionmaker has formulated rules of inference which make the choice process manageable. It can be called a strategy of decision, which, more importantly, describes how decision premises affect decisionmaking. By definition, changing the decision premises, as NEPA tries to do, influences the whole process of reaching a decision. If it is successfully implemented, NEPA alters all agency decision activities leading to choice. In contrast to the "classic" rational actor, the boundedly rational decisionmaker must search for or design alternative solutions, in addition to using a decision rule.

The policy literature, for the most part, has made an artificial distinction in treating the search process as a separate step in decisionmaking; where in reality, it is "usually performed simultaneously with the estimation of the effect and merit of each alternative" (Brewer and DeLeon, 1983, 82). Search and choice are interrelated. Alternatives are generated by a limited search process, and a decisionmaker usually follows simple rules. As alternatives are found, they are evaluated. When a solution meets the decision criteria, the choice is accepted, and the search is stopped. The number of requirements relied on is small. Based on the decision premises, one focuses on a limited set of factors and ignores all others. Relatively few alternatives are produced by the search process, and the search is not exhaustive (Janis and Mann, 1977, 29-30).

Satisfying replaces the goal of optimizing which governs the "classic" rational actor. A decision rule, consistent with the goal of satisficing, establishes a set of requirements that a possible solution must surpass to be selected. The decisionmaker limits attention to finding out whether an alternative solution falls above or below minimum cutoff points for each requirement (Janis and Mann, 1977, 30). In the event that a satisfactory solution is not found, attention is directed to modifying the criteria that the solution must meet. The criteria is relaxed so a

solution can be found (March and Simon, 1958, 197-180).

Generation of Alternatives

Consideration of the generation of alternative solutions has received relatively little research attention by decision theorists in comparison to other decision stages, but no one doubts the vital role this stage plays in the performance of decisionmaking. The area has been investigated mostly by cognitive psychologists and later by those concerned with human information processing. Likewise, in the study of agency implementation of NEPA the design of options can not be overlooked because it is interwined with the final outcome.

The focus of attention in the search process follows a general sequence. The search and design process must have a starting point. With rare exceptions problem solvers begin by using commonly held or accepted ideas. Agencies have a history from which precedents can be drawn. With respect to substance, attention is paid first to "variables that are largely within the control of the problemsolving individual or organizational unit." (March and Simon, 1958, 197-180). Second, if an acceptable solution is not found, attention will be directed to changing other variables that are not under direct control. In order for the process to be carried through, some type of evaluation must be made to determine acceptability. It may be

intuitive or informal. Although it is quite obvious, it is important to realize that analysis in the search and design process preempt formal evaluation in decisionmaking. This is in contrast to the ideal rational model in which the development of alternatives is separate and distinct from the succeeding stage of formal evaluation, and in which judgment is deferred during search.

By moving away from this ideal, understanding decision behavior involves consideration of all earlier decision activities leading up to formal evaluation and choice. In a pilot study on the design of alternatives in organizations, Ernest Alexander conceptualized and presented qualified findings on the interaction of decision stages. Alexander's study found that the process of alternative development is inhibited in generating a broad range of options for formal evaluation. An intuitive, or semi-formalized evaluation process occurs before formal evaluation even begins. A preliminary review is linked with design. The surviving alternatives come through a process of blending or elimination until they reach a domain of acceptability. As one might expect, the alternatives produced by this process are likely to be only marginally different. This process involves a series of decisions which seem to be based on a single important value, rather than a formal tradeoff (Alexander, 1979, 398). Importantly, this supports the idea that an early review of alternatives

narrows down the options which are finally reviewed.

Accepting the idea that the decisionmaker narrows or focuses the range of alternatives before any systematic analysis is done, it is important to know how this process is accomplished. Alexander reports that there is a rapid convergence of options, both in number and range, before evaluation. In the review process, criteria without cumbersome data needs or complex judgmental demands get more attention; judgmental factors tend to be undervalued (Alexander, 1979, 396-398). Therefore, any discussion of decision rules should incorporate the inferences used by the decisionmaker in both the design and formal evaluation stages.

Rules of Inference

By stepping back from the picture of decisionmaking shown above, one can take a complete view of the process offered by theorists of bounded rationality and the findings of Alexander. The selection process begins with the search for alternatives and ends with a formal evaluation. In a truly cybernetic model of choice there is no distinct evaluation, but one is made here because the evaluation stage is recognized formally in administrative rules and procedures. Consistent with boundedly rational behavior, a decisionmaker, facing a complex problem, can go through a number of iterations of "search and modify

expectations" before finding a satisfactory solution (Mack, 1971, 175-9). The iterations before final selection are done to either reduce a prohibitive number of or to increase the availability of options. In an organizational context decisionmakers usually enter the formal evaluation stage with a set of choices to consider. By this time, as Alexander reports, the alternatives are in a domain of acceptability. Thus the final formal evaluation is the last iteration to select a solution.

The rationality in the process lies in the consistency of the inferences made in each iteration leading to the final choice. At each point in the process the decision-maker limits attention to finding out whether an alternative meets a set of requirements. Thus each decision to eliminate or blend an alternative is made according to a decision rule, as is the final selection.

The findings of Alexander's pilot study substantiate the importance of pre-selection activities, especially search, to the final outcomes. Therefore, it is expected that pre-selection activities have a significant impact on the implementation of NEPA by project sponsoring agencies. NEPA, in its attempt to impose rationality on agency decisionmaking, puts the project decisionmaker in a peculiar situation. Although NEPA imposes an "ideal" rational decisionmaking process on decisionmakers, decisionmakers respond with decision strategies consistent

with the principle of bound rationality. The successful implementation of NEPA would be in the form of a decision strategy which would include environmental factors in the search and design stage, as well as in formal evaluation.

Agency Compliance with NEPA

It was pointed out earlier that Congress was fortunate to have specified an implementation mechanism as part of NEPA's mandate. The primary component of that mechanism is the environmental impact statement which tries to bring comprehensiveness and rationality to the administrative process. While the purpose of institutionalizing this in the process is better decisionmaking, NEPA's mandate is also one way to control the discretion delegated to public agencies (West, 1983, 326). Its intuitive appeal is its emphasis on objectivity and efficiency. The mandate assumes that the statutory goals are clear, and the implementation is "tractable" (Mazmanian and Sabatier, 1983). If this is not the case, not only is implementation going to pose a problem for the implementing agency, but it poses an equally difficult problem for the overseer to determine compliance. Thus, the implementation dilemma, associated with NEPA and faced by agency bureaucrats, carries over to affect the review and determination of compliance itself.

The discussion of boundedly rational behavior suggests a model of how agencies are expected to operate in carrying out NEPA, but it assumes that the agencies' goals are specified. What is being offered here is the idea that agencies simplify the complexity of their decision problem in a boundedly rational fashion, and they do it according to premises derived from their goals. Since NEPA fails to provide useable premises, a theory is needed to prescribe their origin. Agencies do not work in a vacuum but in a very political environment. The discussion turns to describe the bureaucratic politics behind implementation to determine the make-up of agencies' essential variable set which governs, in part, how agencies cope.

Bureaucratic Politics

Until now the discussion has centered on the way agencies identify, break-down, and generate solutions to problems they face, and how NEPA attempts to reform this process. This organizational approach, based on the principle of bounded rationality, placed emphasis on routines or programs that an agency has for problem solving and implementing courses of action. These programs bring information to decision points in the process of generating alternatives and analyzing the consequences of proposed actions. What this organizational approach fails to consider is the political environment of implementing agencies which

determines the nature of the decision premises. This is especially crucial in the case of NEPA in which the decision premises are ambiguous.

Without clarity and feasibility of policy, NEPA's implementation and the decisions, which it is designed to affect, can not be made by a single, rational choice, but "by the pulling and hauling that is politics" (Allison, 1971, 144). From this point of view agency compliance is not the result of reaching a pre-determined solution, but more a result of agency compromise and conflict resolution among the many possible interests effected by the decision. The decisions that are made and the action which follows are not based solely on supporting reasons or organizational routines, but also on the power and skill exercised by the actors in the decision process.

The important questions, asked by a bureaucratic politics approach, are offered by Allison:

> 1. What are the existing action channels for producing actions on this kind of problem?
>
> 2. Which players in what positions are centrally involved?
>
> 3. How do pressures of job, past stance, and personality affect the central players on this issue?
>
> 4. Where are foul-ups likely? (1971, 257)

These questions show that the important determinants of choice involve greater details of individual leaders or

agencies of government and the politics among them.

A Bureaucratic Strategy for NEPA Compliance

The political bureaucratic picture just described can be perceived within the structure of how organizations make decisions in a boundedly rational way. Project sponsoring agencies can be seen as actors with specific desires and goals which they would like to attain. These agencies bargain with other agencies which are likewise pursuing their interests. Goal conflict is inevitable given government's shared responsibilities. Governmental choices are the result of bargaining along regularized channels (Allison, 1971, 162-180). The bargaining game is played by actors with different goals, different positions and authority, different demands, and unequal levels of influence. Given this environment, what can agencies be expected to do.

Perceiving an agency as an actor in a bargaining situation, an agency is expected to serve its own best interest. In the private sector this amounts to trying to maximize profit. Because the public sector does not work to profit, another objective is necessary. Given that the bureaucracy serves at the grace of the public, governmental agencies have been thought to try to enhance and promote their survival. Thus agencies can be expected to develop a strategy or plan of action which protects their survival

in the process of implementing policy.

In the case of being called upon to implement NEPA, some agencies ignored the law until they determined that failure to do so would be detrimental to their budget, on-going projects, and their very existence. Being pressured by the political environment, agencies had to face the impossibility dilemma described earlier. Forced to comply, it is hypothesized that they responded in the best way they knew, given their self-interest in survival.

Agency response can be characterized in the following way:

1. Agencies try to maintain control over as much of the decision process as possible;

2. Agencies try to reduce conflict by anticipating and avoiding problem issues;

3. Agencies try to comply with parts of the law that are easiest to meet;

4. Agencies try to restrict choice in decisions which they can not control.

These characteristics of agency behavior allow the agency to meet its own mission, and survive. What an agency is expected to do is develop in its own way a strategy of decisionmaking which exhibits these tendencies of goal achievement with minimal conflict.

Conclusion

The principle of bounded rationality and the work of Simon, March and others in developing this principle has influenced ideas of human decisionmaking to consider broader dimensions of this human activity, while relaxing the assumptions of the classical rational actor model. A decisionmaker, contemplating a "real life" decision, adopts simplifying rules and procedures to cope with the complexity of the problem situation. The way a human decisionmaker simplifies the complexity of the problem is rooted in the makeup of his cognitive structure and in his decision premises.

Administrative agencies of the federal government face the complexity every day in planning and decision activities. Agencies simplify the problem of choice like individual decisionmakers. The enactment of NEPA is an attempt to alter agency decision premises to reflect a national policy for the natural environment. In essence, it redefined the roles of federal agencies. Not only do agencies strive to meet their specific agency mandates, but now they must do so in a manner which enhances nationally desirable qualities of the environment for future generations. By redefining agency roles, and thus changing decision premises, the drafters of NEPA expect to observe decisions which are based on the integration of this

broader concern with agency goals. To back up this change, NEPA promotes decisionmaking which is comprehensive and rational in the implementation of its substantive policy.

Although this decisionmaking process is being imposed by NEPA, implementing agencies operate in boundedly rational fashion. Given an understanding of "real life" decisionmaking, one expects to find a relationship between agency decisions and characteristics of the selected alternatives. That is, agency decisions should be a function of the social, economic, and environmental attributes of the solutions; all attributes are not considered by a boundedly rational agency but only a small number of essential, but simply defined factors. Putting the agency in its political environment, suggests that these essential factors are determined by compromise between the actors involved in the process. Compliance is bargained in the political arena. The essential factors reflect the strategy adopted by the decisionmaking agency.

Simple algorithms are used to minimize the calculations of consequences whether informally in searching for solutions or formally in evaluation. There is a correspondence between the essential factors and an agency's set of goals. Thus, agencies use standard operating procedures but they are strategic, politically directed. The successful implementation of NEPA mandates would mean the inclusion of environmental factors in an agency's goals and represented

in its essential factor set.

This study attempts to develop a model of agency decisionmaking under NEPA which reveals the nature of this relationship--the underlying decision criteria. In the chapter that follows, this model of agency decisionmaking under NEPA is further developed and operationalized. An estimation procedure is described for estimating an agency's decision criteria based on the public information from environmental impact statements and supporting documents.

CHAPTER THREE

DECISION MODEL: HIGHWAY ROUTE LOCATION DECISIONMAKING IN MICHIGAN

In the preceding discussion it is argued that one must consider the complexity of the decision problem and human limitations in order to understand human decisionmaking behavior. Grounded on the theoretical principles of how humans make decisions, characteristics of a general model of decisionmaking are offered. Assuming that a project sponsoring agency acts like an individual decisionmaker, these characteristics can help formulate a model of agency decisionmaking in the implementation of NEPA. This study provides an operationalization of these characteristics in a model of highway route location decisionmaking by the Michigan Department of Transportation (MDOT) and a technique for its estimation. Specifically, answers are sought to the following questions: (1) How does the MDOT make route location choices? To what extent is a route decision determined by a simple decision rule? and (2) What weight is given for social, economic, and environmental factors reported in agency decision documents?

The Decision

A general model of agency decisionmaking under NEPA is presented in Chapter Two. To test this model, this study focuses on the decision behavior of the MDOT in developing and maintaining the quality of transportation in Michigan. Because a large portion of highway construction is financed with federal-aid highway funds, the MDOT must follow, among other procedures, the requirements of NEPA if it wishes to qualify for this aid. Federal-aid high funds are administered by the Federal Highway Administration (FHWA), which is located in the U.S. Department of Transportation. The FHWA assists the MDOT in applying for aid and in meeting federal requirements.

Although NEPA guidelines, and later Implementing Regulations, interpret how to carry out the law, the FHWA took the initiative to draft their own administrative regulations with respect to NEPA. NEPA's mandate is tailored to the peculiarities of transportation planning by the FHWA (see 23 CFR 771). The MDOT, designated as the "highway agency", puts into action these administrative procedures from the FHWA. The implementation of FHWA rules likewise require the MDOT to develop their own procedures to instruct its staff. As required by Section 136(b) of the Federal-Aid Highway Act of 1970, the Federal Highway Administration developed process guidelines for considering social,

economic, and environmental effects of highway projects in Policy and Procedures Memorandum 90-4. PPM 90-4 was designed to aid the various state highway agencies in identifying and reviewing their present organizations and processes that are related to these impacts. The MDOT Action Plan was developed to meet the requirements of PPM 90-4. It is a "...through description of the organization and processes to be followed in the development of federal-aid highway projects, from their conception in the systems planning to the point where all significant planning alternatives have been eliminated." (MDOT, 1974, i). As one can see, the operationalization of NEPA involves a hierarchy of interpretations from the statute to administrative action. This study relies on the final interpretation at the project level to test the general model.

Type of Decision: Highway Route Location

The MDOT activities include planning and development of all modes of transportation in the state. Highway planning considers decisions on route, interchange, and structure location. For the purposes of this study, the primary focus is highway route location. This usually requires the completion of the NEPA planning process, or an environmental assessment which argues for exempting a particular project from further NEPA requirements. The interest here is in those projects which demand the execution of the NEPA process.

MDOT's highway planning provides an excellent example for the study of decisionmaking under NEPA for a number of reasons. First, the nature of MDOT's mandate to provide safe and efficient transportation requires a commitment to continuous planning. Given this need to plan, the MDOT has formalized its planning and decision activities in standard operating procedures, or rules of thumb for reoccurring situations. Variation in the factors of decision should reflect the complexity of the problem situation more than changes in the makeup of the Department. Second, the scope and nature of highway transportation planning includes the full gamut of social, economic, and environmental issues. Although some other types of federal programs may require compliance with NEPA, they may only face a few environmental issues or ones that are limited in scope. Highway transportation planning is multi-dimensional; it must deal with many issues at both the macro and micro levels. Highway planners can not avoid the complexity of the environment. Third, more so than other agencies, the MDOT must confront the implementation problems associated with NEPA in its everyday activities. Since the inception of the law, it has developed a record of decisions which demonstrate its response or manner of coping with complexity.

The Decisionmaker: MDOT

The authoritative decision body of the MDOT is the Michigan Transportation Commission. The Commission is made

up of four members, appointed by the Governor with advice and consent of the State Senate. No more than two members can be of the same political party. The members serve staggered four-year terms. The Commission commands a staff which, historically, has developed an expertise in highway planning and engineering. Starting from its highway orientation, the scope of responsibility of the MDOT was expanded in 1972 to include other modes of transportation - airports, railways, public transportation systems, and bikeways. Given the MDOT's vast responsibility, the Commission must rely on the staff experience and knowledge in each field of planning. Almost as a rule, the Commission accepts the departmental staff recommendations of project level choices. Project decisions are assumed to be the outcomes of organizational processes and procedures.

The MDOT, as any specific function department, has a set of goals that govern their behavior. The primary concern of the MDOT is maintenance and expansion of transportation service of the state. The emphasis is expected to vary between maintaining and expanding, depending on the nature of travel demand in Michigan and on the resources of the state. It is also in the best interest of the MDOT to qualify for federal matching funds to build its projects. Therefore, the MDOT makes the effort to have its routes designated as part of the Interstate System or US network. While it can be argued that Michigan, like any other state,

wants to get its fair share of federal aid, the objective is to try to get as much as possible.

Decision Process: Route Location Planning

Highway route location planning begins with the recognition of transportation problem areas. These areas or trouble spots are located by, among other things, a rating system which identifies deficiencies in transportation service. The condition of the transportation system is used at the statewide planning level to establish needs for the regions of Michigan. Once a set of needed highway transportation projects is identified, a number is selected each year to study for possible improvement. The MDOT commences planning procedures for each selected project. Depending on the nature of a route location project, alternative transportation corridors may be considered first. Corridor analysis is followed by an examination of alternative routes within a chosen corridor. In another study of highway planning, the number of alternatives which are considered seems to be a function of the physical constraints present in the corridor, expected cost of the project, and the extent of "community distributional effects" (McFadden, 1975, 404). Information about the effects of each alternative route is organized and presented in a Draft EIS. The Draft is reviewed closely by the FHWA,

and upon approval it is distributed to the public and to governmental agencies.

After the completion of the first Draft EIS, a series of public meetings, and later hearings, are conducted to generate any information which may have been overlooked, as well as interagency and public review and criticism. Public hearings, more importantly, serve to establish a record of comments on the planning process, and of the preferences of citizen, business, and other interest groups. Upon completion of public hearings all information and comments are reviewed by the MDOT staff. Where necessary, answers are developed to questions raised during the public hearings. If additional analysis is not required, the final EIS is written, and a recommendation of a highway alternative is made to the Transportation Commission. The results of the MDOT planning and environmental analysis is reported to the Commission in a Project Engineering Report. After reviewing this report, the Transportation Commission makes its decision on the fate of the project.

Once the Commission makes its route location decision, the MDOT applies for final federal approval for highway funds.

Decision Criteria

The MDOT presented and evaluated thirty-one route location factors in its Project Engineering Report during

the time period of this study. While this in itself is a substantial reduction from the universe of factors which make up the human environment, the principle of bounded rationality suggests that the decisionmaker manages the complexity of the problem at hand by focusing on only a handful of important or essential factors. Likewise, the MDOT processes the information reported in the Project Engineering Report by focusing its attention on what it deems to be essential decision factors. The way it processes the information from the essential factors depends on the choice criterion. It is assumed that there exists an implicit choice criterion that governs MDOT behavior. In order that some understanding can be brought to the question of MDOT decisionmaking, it is necessary to hypothesize the makeup of the essential factor set.

Although the MDOT reports on thirty-one route location factors, it does so in accordance with FHWA guidelines. These decision factors fall into eight general categories (23 CFR 790.3(c)). The MDOT, on the other hand, uses only those variables which it feels are important. What is considered important is shaped by its perspective, experience, and external pressure. MDOT's history, like that of an individual, represents a record of trial and error. From this record, a set of standard procedures is developed and fine tuned. These standards allow the MDOT to deal with difficult decision situations. Certain simple

patterns of behavior or rules of thumb are relied on by the organization. In the pre-NEPA period highway planning by the MDOT consisted of a series of sequential steps which processed inputs from the staff and department programs, and which made outputs in the form of recommendations "...in relative isolation from outside influence." (MDOT, 1974, v). The external costs to the local economy, social cohesion, and environment were secondary to transportation goals.

The introduction of NEPA called for a change, a new response. Part of the MDOT's response is the development of its Action Plan and subsequent reorganization to implement the plan. The Action Plan opened avenues of communication and review between the MDOT and other federal and state departments during the project planning process. While this was a significant achievement in itself, this study is interested in the decisions which are the outcome of this reform in the decisionmaking process.

In Chapter Two the point is made that in spite of the NEPA mandate for a systematic and comprehensive decision process human decisionmakers are boundedly rational and use simplifying strategies to deal with complex problems. Consistent with the discussion of boundedly rational behavior, it is argued here that the MDOT adopts a planning procedure which reduces decision alternatives to a final set of acceptable ones which are then given a formal

review. The final set of acceptable alternatives are also in compliance with NEPA and other statutes. It seems unreasonable for the MDOT to even consider alternative route locations which might fail to comply. Thus, although compliance is not granted until the final Commission decision is made, the MDOT uses its experience and the aid of the FHWA administrator to produce options during the design stage. The questions are which route location factors are part of the MDOT's essential variable set, and are the environmental factors part of this set?

MDOT Route Location Premises

The decision criteria of the MDOT are consistent with the Department's responsibilities, aspirations, and view of the world -- its perceived role. The MDOT, like all agencies of government, is given executive and legislated mandates which shape its role in the state bureaucracy. At the heart of the MDOT's perceived role are the fact and value premises which guide it in assessing and solving problems it must answer. It is hypothesized that the MDOT's factual premises instruct it, in making route location decisions, to focus on calculating the level of transportation service, reasonableness of cost, degree of community compatibility, and compliance with federal requirements.

The Department would like to design and select highway routes that serve a number of purposes. First, and maybe

foremost, it is in the interest of the MDOT to demonstrate its planning and engineering expertise by improving the transportation system of the state. From an engineering perspective, objective standards exist to determine the degree of improvement. Second, an alternative, just like a project itself, needs to be justified. Transportation alone is not a reason for a project, but the benefits accruing to the communities serviced by the transportation system are. The degree of "fit" between the proposed alternative route and existing and future community needs and service demands describes how the transportation benefits will be distributed. It seems important that the MDOT select routes that benefit the Department's perceived clientele. Third, the MDOT, while not willing or able to find the most cost effective alternative route meeting its goals, would still try to show its cost consciousness. Being a public agency, the MDOT can not appear to be unconstrained with public money. At the same time there usually is very little outside, public expertise which can determine if there are more beneficial or less costly alternatives than the ones designed and analyzed by the MDOT.

Finally, MDOT wants routes which qualify for federal highway funds. Thus factual premises must reflect compliance with FHWA administrative regulations. The federal regulations, of which NEPA is part, put constraints on the

selection of a route. Given the scope and nature of NEPA's mandate, compliance is not a single objective determination, and it will be discussed further.

MDOT Compliance

In Chapter Two compliance is defined as a determination by an overseer that the implementation of a program or plan of action has or has not been followed by the implementers. This determination depends on the information and knowledge available about implementation and the strategy of the implementers. MDOT compliance with NEPA through the FHWA regulations depends on the implementation plan established by the MDOT and approved by the FHWA. NEPA's implementation requires both procedural and substantive components.

In the initial years of NEPA the implementation plan was generally described in DOT Policy and Procedure Memorandums. In 1974 the highway decisionmaking process was specifically outlined by the MDOT, as well as by all states applying for federal highway funds, in its Action Plan. For the most part, the Action Plan spells out the types of studies which should be performed and the impacts which should be discussed. It provides a program for collecting, coordinating, and integrating information from the public and other parts of government. The concern of this study is centered on the application of the

substantive component of NEPA. It is assumed that the MDOT would avoid the risk of losing federal funds or of project delays from judicial action due to procedural non-compliance. In addition, the incentive to comply procedurally is greater because it is relatively easy, and also failure to comply is likewise easy to detect.

Compliance could be characterized by the overseer exercising both control and management activities. It is hypothesized that the MDOT under the direction of the FHWA follows a strategy. A strategy, leading to compliance, is one where attention is paid to meeting easily verifiable standards and where satisfying ambiguous factors is negotiated. The MDOT is expected to use as factual decision premises the statutory requirements, such as air, noise, and water pollution standards, which are under the NEPA umbrella. These and similarly developed standards serve as constraints within which solutions are sought. On the other hand, general and non-specific environmental factors which are in the spirit of the Act, such as general ecology, wildlife habitats, and community cohesion, are weakly defined and poorly understood. Whether or not these factors influence decisionmaking depends on the managing or problem-solving attitude of the FHWA and MDOT response.

The way in which the MDOT combines, blends, or eliminates policies pertinent to highway route location determines the nature of the value premises. Value premises

are adopted for which the conflicting interests in each transportation project are minimized.

The MDOT Decision Rule

The MDOT relies on rules of inference to reduce the universe of choices and provide a set of appropriate alternatives within which selection can be made. The number of choices is reduced by assuming that the MDOT gives attention to a limited number of variables. It is assumed that the MDOT selects the alternative solution which yields most perceivable net benefit in terms of its goals. The MDOT adds the weighted variables of its essential set. The weights for the essential variables are the value premises which are derived from the interaction of the MDOT and its political environment. In this case, the MDOT combines the weights attached to the set of route location factors.

Route Location Factors

The choice of an alternative solution to a transportation project by the MDOT culminates the highway planning process. Outcomes of MDOT planning are a function of an underlying choice criterion. The empirical analysis of this study attempts to determine the underlying choice criterion from MDOT's history of decisions.

The empirical analysis is based on data collected from route location environmental impact statements and corresponding project engineering reports. The period of investigation is 1970 to 1980. During this period there were twenty-six projects reported. These are the primary decision documents of the MDOT. These documents summarize the process and all information available to the MDOT, as well as comments and criticisms generated through the public review process, on alternative routes.

The description of the general model of decisionmaking suggested that a decisionmaker focuses only on a few essential variables in order to make a decision in complexity. This study assumes that these variables are reported in the MDOT decision documents.

An examination of Project Engineering Reports reveals that the MDOT assesses and reports on social, economic, and environmental effects by using thirty-one factors. The decision factors are presented in Table 3.1. The information that is reported in the text on each factor ranges from specific enumerations to short descriptive comments. In addition, each report summarizes the social, economic, and environmental effects for each alternative in terms of the degree of advantages each is evaluated to possess. Advantages are rated as "major", "minor", or "no significant difference". These are ratings against the other competing alternatives in the set being evaluated. These judgments

Table 3.1
List of MDOT Route Location Factors

1. REGIONAL AND COMMUNITY GROWTH
   a. General plans and proposed land use
   b. Total transportation requirements
   c. Status of the planning process
   d. Fast, safe and efficient transportation

2. CONSERVATION AND PRESERVATION
   a. Soil erosion and sedimentation
   b. General ecology of the area
   c. Park and recreational facilities
   d. Wildlife and watersowl areas
   e. Historic and natural landmarks

3. PUBLIC FACILITIES AND SERVICES
   a. Religious facilities
   b. Health facilities
   c. Educational facilities
   d. Public utilities
   e. Fire protection and other emergency services
   f. National and civil defense

4. COMMUNITY COHESION
   a. Residential and neighborhood character and stability
   b. Minority and other specific groups and interests
   c. Local tax base
   d. Property values

5. DISPLACEMENT OF PEOPLE, BUSINESSES, AND FARMS
   a. Displacement
   b. Relocation assistance
   c. Replacement housing
   d. Economic activity and employment

6. AIR, NOISE AND WATER POLLUTION
   a. Air pollution
   b. Noise pollution
   c. Water pollution

7. AESTHETIC AND OTHER VALUES
   a. Visual quality
   b. Joint development and multiple use of space

8. PROJECT AND RELATED FACILITIES COSTS
   a. Engineering, right of way and construction costs
   b. Maintenance and operating costs
   c. Operation and use of existing facilities and other transportation facilities during construction and after completion

about the degree of advantage are point by point evaluations of alternative routes on each factor. Many of these judgments have to consider non-measurable, as well as measurable impacts. It is assumed that these point by point ratings are true reflections of MDOT analyses of the social, economic, and environmental factors required by NEPA and other legislation.

The essential variables are found, it is hypothesized, in the reported factors in Project Engineering Reports. The route location factors are discussed in two general categories. The first category is transportation, planning and cost. It represents those factors that are closest to the MDOT's mission or goal. The second category covers all other factors which provide a more specific picture of the impacts associated with a transportation project.

Transportation, Planning, and Cost

Providing direct benefits through a transportation improvement, such as a highway, is the primary goal of the MDOT. Meeting this goal justifies the allocation of project funds, as well as demonstrates MDOT's engineering competence. Transportation benefits are accounted from those factors that lead to fast, safe, and efficient transportation service. Benefits can be accrued by improved service which can be assessed two ways. First, transportation, measured by user cost and travel time, can

be thought to represent the cumulative direct benefit of a proposed alternative route. It is measurable and easily evaluated by the MDOT. One would expect the MDOT to use this variable to determine the acceptability of alternative routes. Second, the compatibility of the transportation alternative with local and regional land use plans is both transportationally and politically significant. Present and future land uses are one of the sources of traffic demands for which the improvement is proposed by handle. While a transportation improvement can be a solution to a problem, it can also act as a generator of opportunities and promote the direction of an area's growth. For this reason, as well as for considering local and regional political interests, one would think that the MDOT pays attention to the status of planning in the project area.

Project costs have many desirable properties to aid MDOT decisionmaking. Direct costs are easy to identify and to calculate. Reliance on the price system provides a convenient common denominator for the assessment of alternatives. Given the assumptions of the market, cost figures tell the decisionmaker about opportunities given up to attain the proposed benefits of an alternative route. Construction costs give an indication of two features of a route: (1) the physical constraints of the natural environment over which it travels, and (2) the amount of resources necessary for its completion. On the other hand,

right-of-way costs describe, in part, the level of indirect costs associated with a particular choice. To the planner and engineer, the sum of these two types of cost into total project cost may be representative of opportunities lost. While some might use this figure, it is generally accepted that there are indirect costs which are missing in this calculation. Supplemental measures are needed. Failure to seriously consider indirect costs along with direct costs to the environment in previous decisionmaking was one of the reasons behind the enactment of NEPA. This flaw in the use of project costs does not outweigh its importance in public sector choice.

The following category, for the most part, describes specific, non-aggregated types of impacts due to the proposed transportation improvement.

Associated Effects

The list of factors reported by the MDOT in accordance with the FHWA regulations is rounded out by those which provide the details of effects or impacts not central to the mission of the Department of Transportation. These associated factors fill the gaps left in the assessment of benefits and project costs. The range of associated factors covers every conceivable impact. Although this is comprehensive, determining the effects of some factors is difficult. Some are based on weakly defined and poorly

understood concepts. They involve dynamic systems (biological, social, economic, and physical), which make calculations very complex. Subsequently, only very simple measures are sought by the decisionmaker.

The MDOT had to deal with such factors even before the enactment of NEPA. Highway projects by design always had associated effects which required attention. With the passing of NEPA, emphasis has been placed on increasing the attention given to these factors, as well as adding to the list. The associated effects are composed of three groups of route location factors: (1) public facilities and service, (2) environment, and (3) social and economic systems. The factors are grouped in this way in Table 3.1.

Associated effects of an alternative route can be either beneficial or costly. Benefits of this type are outside the bounds of the highway planner's primary interest. One would expect the MDOT to do little accounting of them in decisionmaking. This may not be the case for negative or costly effects. It is assumed that negative associated effects decrease the acceptability of a route and the chance that it would comply with the legal mandates. Consistent with boundedly rational behavior, the highway planner can be thought to perceive negative associated effects as design constraints. The planner attempts to avoid these factors as much as possible in the early design stage. This strategy eliminates or modifies unacceptable

features of optional routes to simplify the final choice.

Operational Model of MDOT Decisionmaking

The Dependent Variable

The dependent variable is the MDOT's evaluation of an alternative route for a given highway route location planning project. Because the true evaluation index is unobservable, it is only known whether a route alternative is accepted or rejected. Thus, the dependent variable is given a value of "1" if it is the route recommended by the staff in the Project Engineering Report; it is assigned a value of "0" if not selected.

The Independent Variables

In constructing a model of MDOT route location decision-making independent variables representing the hypothesized factual premises are devised from the reported route location information. All reported factors are initially examined for what they may contribute. In operationalizing the independent variables the MDOT evaluation of advantage is utilized. Although the MDOT rates on a major, minor, and no significant difference scale, there is no information which would suggest that the interval between levels is unitary. Lacking this knowledge, major and minor advantages are rated simply as an advantage.

Research Approach

The process to be followed in analyzing MDOT route location decisions is composed of two steps which are consistent with the theory of decisionmaking in the previous chapter. First, the data will be analyzed to find evidence of screening or filtering by the MDOT in the design stage of the planning process. Second, an estimation will be made using the factors which appear to have been used by the MDOT to differentiate their alternative choices. This two-stage approach recognizes that the whole decision process must be examined to have an accurate picture of MDOT planning. This is especially true if specific factors are used as design constraints in the process. The second stage of this analysis can not stand alone without misleading results.

Screen Factors

It is hypothesized that specific, legislated policy leads to "protected" factors in route location. The MDOT minimizes conflict and project delay by screening out as many of these factors in the generation of alternatives as possible. Laws exist for historic and anthropological sites, endangered species, clean water, noise, coastal zones, wetlands, clean air, and federally subsidized parks (see 49 CFR 771.103). If factors representing these pieces of legislation are screened out, the data analysis

should show them as not being rated very often because each alternative would treat them the same way, and thus no one alternative would be given an advantage. HISTORIC, AIR POLLUTION, NOISE POLLUTION, WATER POLLUTION, PARKS, and WILDLIFE are expected where possible to be screened. In situations where they cannot be screened out, they should coincide with the alternate choice.

Final Decision Factors

Although the screened factors are an important part of the decision process, their lack of use in the final decision stage would prohibit them from being statistically significant in model estimation. In this second stage of analysis, those factors which were used, that is rated, in half or more of the 26 project decisions will be estimated as part of the model. It is hypothesized that these factors will show the MDOT to be following its own goals. If the MDOT has developed a good strategy of minimizing conflict and focusing the decision into its area of expertise, transportation and transportation related factors should be dominant. There are three categories of factors which are transportation related and largely within the control of the MDOT. They are: level of transportation service, degree of community compatibility, and costs.

Level of Transportation Service

There are four factors which the MDOT can use to assess the level of service provided by an alternative route. They are TRANS REQ, TRANS STATUS, TRANS EFFIC, and EXIST RDWY. TRANS REQ and TRANS STATUS establish the priority of the project route and identify the existence of local and regional government plans in the communities in the project study area. These are informational factors which conform, as they all do, to FHWA regulations. There are two design factors. The first in EXIST RDWY which assesses the disruption to existing transportation facilities associated with an alternative during and after construction. Second, TRANS EFFIC is short for "fast, safe and efficient transportation". This variable stands for transportation benefits, and it is usually referred to in terms of "user cost". In many cases user cost is a function of route length. The shorter route length means user time saved. The greater the degree of user cost saved, the more likely the MDOT is to select the route.

Reasonable Cost

The MDOT reports two types of cost associated with a project: PROJECT COST and OPER COST. Operating cost is very closely related to the length of the alternative route. By trying to achieve transportation efficiency, the MDOT almost automatically reduces operating cost. On

the other hand, project costs are more complicated and are determined by natural and social environment encountered by a route. The MDOT is expected to demonstrate its concern for efficient transportation and cost-effectiveness by favoring the least cost alternative route, all other things being equal.

Degree of Community Compatibility

While it could be argued that community compatibility is a function of a number of specific impact factors, GEN PLAN not only considers present compatibility but also the future. By rating each alternative route according to its fit with government land use and development plans, the MDOT evaluates the distribution of transportation benefits against the perceived needs and desires of local governments. The route which enhances this fit increases its likelihood of selection.

Conclusion

The purpose of this chapter is to describe how the theory presented in Chapter Two can be applied to the case of an agency which must implement and comply with NEPA, and to specify how questions about implementation and decisionmaking under this Act can be investigated empirically. The MDOT is an excellent example to study because

their decisions are the type which were the focus of criticism during the environmental movement which led to the passage of NEPA. At the same time they have established a record of implementing the law with all its ambiquities. Using this record of coping and decisionmaking, this study, relying on the boundedly rational model in a political environment, tries to test the hypothesized decision premises used by the MDOT. By examining the whole decision process, as opposed to just final choice, the influence of NEPA can be evaluated in fairer way than by previous research. The significant step in this examination is the analysis of the operational model results, using PROBIT, and of the data itself.

CHAPTER FOUR

ANALYSIS OF EMPIRICAL RESULTS

As the history of modifications of the CEQ Guidelines and the final NEPA Implementing Regulations indicate, the early planning stages of a program or project should be just as important as the final choice stage in integrating NEPA's mandate. Thus the whole process should be examined in the evaluation of implementing this policy. Following the description of MDOT decisionmaking already presented, this study relies on an empirical analysis to develop evidence to determine the MDOT's essential variable set. This analysis, consistent with the need to look at the whole decision process, is divided into two parts. The first part discusses the utilization of route location factors and makes inferences about their role in early planning. The second part of the analysis is the interpretation of the estimated decision model. Together these parts provide a picture of the MDOT decisionmaking behavior.

The following empirical analysis of MDOT decisionmaking is based on 26 route location decisions made during the period 1970-1980.

Data Analysis: Rated Factors

An examination of the data collected from MDOT Project Engineering Reports offers some clues to the pre-decision activities of a highway project. Table 4.1 shows the number of decisions in which each factor was given a "no significant difference" rating. This rating means that the factor in a project was not significant in the final decision stage because it did little to differentiate the alternatives being considered. There can be a number of reasons for a factor repeatedly receiving a NSD rating. The factor can occur only on rare occasions, be too general or difficult to calculate, or can be a planner's or engineer's design constraint. The greater the number of times a factor does not separate the alternatives the lower its chances of being a determining variable in the final decision stage.

Consistent with the literature on bureaucratic decision-making, it is hypothesized that the MDOT, like any agency, goes through a process which is a preformal analysis of the choice consequences to filter out unacceptable solutions. The decision problem is simplified by the interaction of the design and analysis stages of the process. After design is completed, a set of alternatives are left which are perceived to be feasible and acceptable. They are acceptable in the sense that they meet some minimum operational standards.

Table 4.1 "No Significant Difference" Ratings

Factor	Number of NSD Ratings
Project cost	4
Displacement	5
Transportation efficiency	6
General plans	7
Soils	8
General ecology	9
Residential character	10
Operating cost	10
Local tax base	10
Wildlife	12
Education	13
Visual	13
Existing roadway	15
Parks	16
Water pollution	17
Economic activity	18
Religious	20
Public utility	20
Noise pollution	20
Transportation requirement	20
Transportation status	21
Property values	23
Fire service	23
Air pollution	24
Relocation	24
Replacement	24
Defense	24
Health	24
Minority interest	25
Historic	25
Joint development	25

Number of project decisions = 26

In the case of the MDOT, it is theorized that final alternatives surpass some minimum transportation requirement and comply to specific mandates in the law. The final and formal decision is really one of selecting the best fitting alternative to the remaining and important planning factors which are not handled completely by the discretion of the transportation designer. If this description is correct, the failure of factors to affect route location selection should be examined to determine if their weakness is due to their status as design constraints or to their insignificance.

If certain factors, especially environmental factors, are design constraints in the alternative generation process they would not be significant in the final choice because all alternatives in a project set would have met these design requirements. In examining Table 4.1, four of the environmental factors, NOISE POLLUTION, AIR POLLUTION, JOINT DEVELOPMENT, and HISTORIC, are NSD in twenty or more decisions. Of these four all but JOINT DEVELOPMENT have specific administrative regulations behind them. On the other hand, SOILS, GENERAL ECOLOGY, WILDLIFE, and VISUAL are factors which lack specific statutory backing. These factors are definitely in the spirit of NEPA, and they are clear enough to differentiate alternatives as demonstrated by the number of times they received ratings.

Factors Rated with Choice

The number of times a factor was used to report that an alternative had an advantage and was then selected provides more information about the planning process and potentially important factors. Table 4.2 displays this information. The factors are separated into two groups. Those in the top group were used in over half of the project decisions. The ratio is the number of times a factor was rated out of 74 alternatives in the denominator, and out of that number, how many times it was selected in the numerator.

The route location factors in the top group of Table 4.2 were used more often, and they provided comparative measures for the MDOT. Given their more frequent use, the top group of factors can be tested for their contribution to the final choice at the decision stage. On the other hand, attention should not be cast away from the bottom group of location factors.

If the information on Table 4.1 and 4.2 are examined together, it appears that whenever some of the lesser rated factors are present that they match with the choice a high percentage of the time. For example NOISE POLLUTION was involved in six decisions, and six times the selected alternative had an advantage rating for that factor. Although Table 4.2 shows this factor's ratio of choice to total rated to be six out of 13, it did better on a decision

Table 4.2 Number Rated with Selected Alternative

Factor	Rated with choice/Total rated
Project cost	16/30
Displacement	13/32
Transportation efficiency	13/32
General plans	17/25
Soils	12/22
General ecology	12/23
Residential character	13/22
Operating cost	11/18
Local tax base	11/25
Wildlife	10/19
Education	11/18
Visual	9/20
Existing roadway	6/19
Parks	9/14
Water pollution	7/13
Economic activity	7/16
Religious	5/9
Public utility	4/8
Noise pollution	6/13
Transportation requirement	5/9
Transportation status	3/8
Property values	2/6
Fire service	3/7
Air pollution	2/7
Relocation	2/5
Replacement	2/5
Defense	2/3
Health	2/2
Minority interest	1/2
Historic	0/2
Joint development	0/1

Number of project decisions = 26
Number of alternatives = 74

by decision basis. The reason that there are 13 alternatives rated in only six decisions is due to the fact that some projects included more than two alternatives. This allows for the possibility of more than one being rated for the same decision. This information suggests that route location factors in the bottom group of Table 4.2 which match the final choice a high percent of the time are important to the MDOT but appear infrequently. This infrequent rating can be due to their rare occurence, or as mentioned earlier, their status as design constraints. Caution must be exercised here for although it is suggestive, it is only a correlation.

The finding of the first part of this data analysis is that a number of location factors, dominated by "protected" ones, appear to have been avoided in the designing of project alternatives. By "avoiding" it is meant that the designer or engineer developed options which circumvented critical areas or, in some way, made the options, being considered, equal on that particular factor or attribute.

Model Estimation

The second part of this empirical analysis considers the factors affecting the MDOT's final project choice. A statistical model is described for meeting this purpose.

A series of hypothesis are estimated in order to examine suggested hypothesized decision criterion. A discrete choice model, probit, is used to generate decision factor coefficients. Coefficient estimates can be interpreted in a similar manner as in linear regression. A positive coefficient for a variable implies an increase in the predicted probability that an alternative route will be chosen. There are a few summary statistics which serve as a measure of goodness of fit. One is the log of the likelihood function, and it approaches zero for a perfect fit (Hensher, 1981, 49-52). Another is the likelihood ratio statistic, -2LLR, which is distributed approximately chi-square (McFadden, 1976, 59).

The percentage of correct project decision predictions is also a useful measure. This percentage is computed by first using the estimated results to predict for each project that alternative route with the maximum estimated probability. This is compared to the actual MDOT choice, and the number correctly predicted is divided by the total number of decisions.

The selection of PROBIT is based on its compatibility and convenience for this research.

PROBIT

In studying the influence of NEPA on agency project level decisions one is interested in finding the statistical distribution of decision rules which explains the observed patterns of choice (McFadden, 1975, 402). Given that the attributes of each alternative choice, and the actual project selection are known, one should be able to predict project decisions of an agency, assuming the information on the attributes are part of the agency's essential variable set. More specifically, this analysis attempts to make a statement about the likelihood that a particular alternative choice will be selected. In so doing the relationship between a set of attributes, describing an alternative, and the probability that the alternative will be chosen can be found (Pindyck and Rubinfeld, 1981, 274).

Statistical models suitable for this type of analysis are called qualitative choice models. For qualitative choice models the dependent variable involves two or more qualitative choices. In this case the behavioral responses associated with agency decisions are either "accept" or "reject" for an alternative. A review of the econometric literature offers a number of statistical models for consideration. Two models of this type receive most of the attention; they are the linear probability model, and the "constrained" linear probability model. The "constrained"

linear probability model has two common specifications called probit and logit. These models are based on alternative assumptions about the probabilistic nature of the decision process. Given the nature of the dependent variable, the assumptions of the decision process, and the desire for predictive capacity, the "constrained" linear probability model will be used in this analysis - specifically, the probit model.

The empirical analysis of project decisions by federal agencies begins by assuming that the probability of an alternative solution being selected is a linear function of the attributes of that solution. These attributes are the essential variables which are monitored by an agency. Let "A" be the choice set of recognized competing alternative solutions, and let the agency's evaluation of alternative "a", which is an element of A, be given by $V_a = V(X_a, \beta, \varepsilon_a)$, where X_a is a vector of alternative a's comparative attributes, β is a vector of coefficients, and ε_a is the disturbance term. X_a contains the essential variables. These correspond to the requirements of NEPA. An alternative solution "a" is selected if V_a is above the agency's critical cutoff value, V_a^*. The decision can be represented as,

$$\text{agency} \begin{cases} \text{accepts "a", } Y_a=1, \text{ if } V_a > V_a^* \\ \text{rejects "a", } Y_a=0, \text{ if } V_a > V_a^* \end{cases}$$

What must be noted is that the value of V_a is unobserved. It is assumed that the decisionmaking agency has an index, V_a, which reflects its likelihood to accept an alternative solution. The index, V_a, is assumed to be a continuous variable which is random and normally distributed. What is known is only the observed choice, that is Y_a=0 or 1. The underlying model in regression form is,

$$V_a = \alpha + \beta X_a + \varepsilon_a$$

Since one is interested in the probability of an alternative being accepted or rejected, it is necessary to transform the model such that predictions will lie in the (0,1) interval for all X. Further, one

> ...would also like the transformation to maintain the property that increases in X are associated with increases (or decreases) in the dependent variable for all values of X (Pindyck and Rubinfeld, 1981, 280).

The transformation for the probit model is provided by using the cumulative normal probability function. Thus, the probability can be represented by,

$$P_a = F(\alpha + \beta X_a) = F(V_a)$$

where F is the cumulative normal probability function.

The probit model assumes that V_a^* is a normally distributed random variable; the probability that V_a^*

is less than or equal to V_a can be computed from the cumulative normal probability function. "The cumulative normal function assigns to a number (V) the probability that any arbitrary (V*) will be less than or equal to (V)" (Pindyck and Rubinfeld, 1981, 282). The standardized cumulative normal function is,

$$P_a = F(V_a) = \frac{1}{2\pi} \int_{-\infty}^{V_a} e^{-S^2/2}\, ds$$

where "s" is a random variable which is normally distributed with mean zero and unit variance. By construction, P_a will lie in the (0,1) interval. P_a represents the probability that alternative "a" will be selected by the agency. Since this probability is measured by the area under the standard normal curve from $-\infty$ to V_a, the alternative is more likely to be selected the greater the value of the index V_a.

In order to obtain an estimate of the index V_a, it is necessary to apply the inverse of the cumulative normal function.

$$V_a = F^{-1}(P_a) = \alpha + \beta X_a$$

The probability P_a is interpreted as the conditional probability that the agency will select a particular alternative given the alternative's attributes. This is equivalent to the probability that a standard normal variable will be less than or equal to $\alpha + \beta X_a$, which is

the sum of the weighted attributes.

Because the cumulative normal transformation, used in the probit model, is nonlinear, ordinary least squares can not be applied. Maximum-likelihood estimation can obtain values for α and β. These parameter estimates will be consistent and the appropriate statistical tests can be performed (Pindyck and Rubinfeld, 1981, 283). Given the nature of the estimation algorithm, it is necessary to offer an explanation of the probit parameter estimates. The unobserved dependent variable, V_a, is a standard normal variable. The maximum likelihood coefficients represent the change in the standard normal variable that occurs with each unit change in the independent variable, holding all other variables constant. Since V_a has a unit variance, the change in the dependent variable can be interpreted in standard deviation units (Ostrom and Job, 1982, 34). Further, because the specification of the relationship is nonlinear, the change in P associated with a change in X is dependent on the particular value of X selected.

The amount of influence, that individual variables have on the probability that alternative route is selected, depends on how close V_a is to V_a^*; the closer it is to V_a^* the more impact the variable has.

The probit model is used to estimate the decision model described earlier.

Hypothesis Tests

Three estimates of a model of MDOT route location decisionmaking under NEPA are presented in Table 4.3. These estimates examine the factors which were used in over half of the project decisions. It was hypothesized that, by the final decision stage, the transportation and related factors under the direction of the MDOT would be strongly related to alternative choice.

Estimate I is composed of all factors in the top group from Table 4.2. Only two factors are significant; GEN PLAN and PROJ-COST. This form of the model predicts well, 84.5%, but lacks other significant variables. There is a suspected problem with multicollinear variables. This would make significance tests meaningless. The result of a Farrer-Glauber test, regressing each independent variable on the others, shows that to be the case.

Estimate II combines seemingly collinear factors into combined variables to reduce the degree of multicollinearity. Factors were combined which made substantive sense. ECOL is composed of SOILS, WILDLIFE, and GEN ECOLOGY. CHAR equals RES CHARACTER and EDUCATION; CHANGE combines DISPLACEMENT and LOCAL TX BASE. This estimate performs very much the same as the first. ECOL and CHAR are close to being significant.

Table 4.3 Model of route location decisions

Factors	I	II	III
Constant	-2.09*	-2.057*	-1.920*
GEN PLAN	1.998*	1.813*	1.554*
TRANS EFFIC	- .494	- .334	- .319
PROJ COST	1.342*	1.332*	
OPER COST	.457	.332	
MONEY			1.111*
EDUCATION	.636		
SOILS	.711		
GEN ECOLOGY	.225		
WILDLIFE	.095		
ECOL		.641	.622*
VISUAL	.189		
CHAR		.672	.702*
RES CHARACTER	-.173		
LOCAL TX BASE	.158		
DISPLACEMENT	-.279		
CHANGE		- .304	- .205
% Predicted	84.6	84.6	80.8
Log Likelihood	-27.58	-28.37	-30.20
-2X LLF	40.77**	39.19**	35.54**

Note: ECOL = (SOILS, WILDLIFE, GEN ECOLOGY)
CHAR = (RES CHARACTER, EDUCATION)
CHANGE = (DISPLACEMENT, LOCAL TX BASE)
MONEY = (PROJ COST, OPER COST)

Data: MDOT Project Engineering Reports, 1970-1979.
N = 74 alternatives; 26 decisions.

Key: * Significant at the .05 level for one-tail test.
**Significant at the .01 level, chi-square test.

Estimate III treats the collinearity of the cost variables by combining PROJ COST and OPER COST into one variable, MONEY, and discarding very weak variables. This final estimate continues to show GEN PLAN and MONEY to be significant and heavily weighted, while ECOL and CHAR are significant, but very weak.

Conclusion

The objective of the empirical investigation in this chapter is the determination of an implicit choice criterion, if one exists, of the MDOT which is used to select highway route locations. The results of the estimated model reveal a choice criterion which explains the outcomes of this agency's decisions. The variables of the decision model are derived from the information reported in the MDOT documents which are part of the public record. The success of the estimated model supports the assumption that MDOT Project Engineering Reports provide the bulk of information utilized by the agency in their decisionmaking.

The overall findings of the probit model estimations lead one to believe that the MDOT places more emphasis on tailoring its projects to the growth and development plans of the communities in the study area, demonstrating relative cost consciousness, and, to a much lesser extent, heeding the impact on residential character and the natural

environment than on the other location factors. It must be remembered that these results represent an average weighting of factors in decisions taken from a statistical distribution of decision rules which explain patterns of choice (McFadden, 1975, 402). This means that the MDOT may not have relied on one decision criterion in making all its route location selections, given the complexity and available information on any one project. The results of the estimated model represent the "average rationale" of the MDOT in making highway route selections.

Even though the MDOT staff collect and generate a large amount of information in studying each project, no visible attempt is made to do a comprehensive benefit-cost analysis (BCA). This is due, in part, to the Department's recognition of the pitfalls of BCA, especially in counting indirect benefits and costs. Instead of reducing all highway benefits and costs into an aggregate measure, the MDOT reports them descriptively and rates each alternative on each factor. Variables, ECOL, CHAR and CHANGE represent impact factors which have indirect benefits and costs associated with them. Based on the model results, the only indirect effects weighed are ECOL and CHAR and only just significant.

The impact of the environmental factors on route location is significant, but weak. This reveals that, even though it processes environmental information about

the impact of proposed transportation improvements on the natural environment in its analyses, the MDOT is not very sensitive to these general concerns. There are two possible ways to look at the weakness of the environmental factors. First, in order for a factor to be used, the information must be available and the decisionmaker must perceive that the information is valid. Given the infancy of environmental assessment, it is very likely that the MDOT failed to use environmental impact information because it suspected the validity of the findings. Second, the MDOT may question the importance of the NEPA policy in highway planning, and only comply with the procedural requirements of the Act. This is what Congress anticipated might be the bureaucratic response, and what led to the strengthening of the public participation in the decision process. It is also possible for an agency to meet the ends of "procedural compliance only" by claiming the factors lack substantive validity. This is a political strategy to avoid opening up the process.

The picture that this empirical analysis gives of MDOT decisionmaking behavior under NEPA is one where the attainment of departmental objectives seems to predominate over other factors of consideration, especially environmental benefits and costs. The strength of the MDOT's sensitivity to community plans and proposed land uses is a demonstration of that point. Land use plans represent

a community's future development direction and preferences. Similarly, compatibility with these plans means meeting future transportation needs and demands. That is a planning and engineering bias. At the same time it should not be forgotten that the MDOT, like all public agencies, is subject to public and political pressure. The MDOT gives recognition to the preferences of communities in the project area by taking their plans into consideration.

An unanticipated finding is the insignificance of the transportation factors in the final decisionmaking stage. Although this seems inconsistent with the attainment of the Department's objectives, it is argued here that this is consistent with a broader consideration of the decision-making process. This broader point of view recognizes that decisionmaking is more than the selection of the best alternative. It involves the search or design of the alternatives in addition to the analysis of the alternatives. The manner by which the decision alternatives are generated has a significant influence on the outcome or consequence. The weakness of the transportation and environmental factors suggests a closer examination of the data in line with the "strategic" planning notion presented earlier.

The information presented in Table 4.1 suggests questions for which answers can not be found in the Project Engineering Reports and FHWA documents. Generally

speaking, what are the design premises used in the generation of alternatives? How is environmental policy reflected in these premises? Are environmental factors considered in some "zone of acceptance?" To find answers to these questions the next chapter discusses the planning process in one MDOT highway route location study.

CHAPTER FIVE

A CASE STUDY OF MDOT DECISIONMAKING: ROUTE LOCATION PLANNING FOR INTERSTATE 69 FROM CHARLOTTE TO LANSING

Introduction

In the previous chapter a set of route location decisions made by the MDOT were studied to determine whether environmental factors were part of its decision criterion. The purpose of this chapter is to focus on one project decision in order to supplement the conclusions of the empirical investigation. A case study of one route location planning process can show how the MDOT carries out the route location process, how it reports and integrates location factors, and how it responds to conflicting policies in decisionmaking.

The conclusions of the empirical investigation imply that the implementation of NEPA follows a mixed strategy of implementation. Likewise, the meaning of agency compliance has both control and management type components. Route location factors, which are easily measured, are thought to be used in the design stage of the planning process. For other important factors a different style is adopted to learn how it can be included in the process. In order to bring more evidence to support these conclusions, a study of one significant and controversial MDOT route location

project is presented.

Project Study: I-69 Route Location Decision

History and Background

A review of the Interstate network in Michigan in the middle 1960's found that the existing system "lacked the integration necessary for complete effectiveness ...due in large part to the termination of I-69 at I-94 near Marshall." (MDOT, 1971, 3). As a result, the MDOT requested that an extension of I-69 from Marshall to Port Huron be included as part of the additional 1,500 miles allocation authorized in the Federal-Aid Highway Act of 1968. The US Department of Transportation approved an extension from Marshall to I-75 at Flint. The route location project which is the focus of this case study covers part of this extension to the Interstate system; I-69 from Charlotte to Lansing is the final link in the freeway between Indianapolis and Lansing and Flint. Other sections of this route had been approved or contracted for construction.

Subsequent to receiving federal approval for the extension of I-69 into the Interstate system, the MDOT commenced with corridor planning between the major transportation control points. A corridor study was completed by the MDOT staff for the segment from Charlotte to northwest Lansing in 1972. Accompanying the corridor study

was a Corridor Environmental Impact Statement which outlined the impacts of the project and compared the alternative corridors. The outcome of the analysis covered in these two documents was the adoption of a generalized location corridor. This corridor went north from Charlotte at Temporary I-69/US-27 and US-27BR intersection and dog-legged to the east to meet I-96, southwest of Lansing. The corridor also included the area from the I-96/I-496 interchange northerly for three miles in order that two more lanes could be added to the existing I-96. This approved corridor sets the boundary for the development and analysis of alternatives route alignments.

In 1976 the Final Alignment EIS was approved. In the process leading up to the Final EIS, the MDOT examined two detailed alignments in the chosen corridor in a Draft Alignment EIS and it held the required public hearings to discuss the information contained in that report. With the completion of the Final Alignment EIS the Federal Highway Administration granted location and design approval in March, 1977.

After FHWA approval had been granted for the project, a group called "Citizens Concerned About I-69" (CCAI) questioned the validity of the approved alignment. Their major concern was that the MDOT did not give full consideration to the impact of the approved alignment in the taking of prime agricultural land. CCAI lobbied successfully to

have the Eaton County Board of Commissioners request that the Michigan Environmental Review Board (MERB) review the approved route with respect to the impact on agricultural land. The request of the County Board gave State Senator Richard Allen an opportunity to enter the conflict in support of local agricultural interests. As a result of the Senator's efforts and those of local agricultural groups, a review was conducted by the Michigan Senate through a series of oversight hearings by its Transportation Committee. Appeals for a review were also made to the Governor's Office. The Governor brought other State Departments to carry out an in-depth review of the issues being raised. Using the Departments of Agriculture and Natural Resources in this review, it was concluded by the Governor's Office that further study was not necessary. The MDOT Commission reanalyzed the information generated during this process and reaffirmed its decision on the approved alignment (MDOT, 1981, 1; Kibby, 1984, 20-23).

Following its failure to get the MDOT to change its alignment decision, the CCAI turned to judicial action as a way to delay the project in order to change the result. In 1980 the CCAI filed suit first in Ingham County Circuit Court, and later in Eaton County Circuit Court, seeking an injunction against proceeding with the I-69 project. Both courts ruled against the injunction. The MDOT could move toward the development of the project.

During the review process and the attempts to attain an injunction, the CCAI kept the staff of Congressman Wolpe informed of the situation. The Congressman set up a meeting with representatives of the USDOT, FHWA, representatives of CCAI, and the chair and director of the Tri-county Regional Planning Commission. The discussion focused on the removal of prime farm land in the course of the I-69 route. At this time the MDOT had begun to let bids for the project, but federal approval of the bid amount was required (Kibby, 1984, 25). While the MDOT was waiting for bid approval, an amendment to the USDOT and Related Agencies Appropriation Act of 1981 was enacted which had the effect of freezing funds for I-69 between Charlotte and Lansing for 90 days. During this holding period, the USDOT reviewed the issues and conducted a public hearing on the project on November 24, 1980. Although the USDOT can review the evidence behind the MDOT decision, it has no power to select alignments; the final decision on route location rests with the MDOT Commission.

As a result of the review activities of his department, the Secretary of Transportation, Neil Goldschmidt, signed a Letter of Findings which stated:

> The State of Michigan has validly received approval for the current alignment and has expended considerable time, effort, and money in project development.
>
> Construction of I-69 in the approved corridor, while it would have certain advantages, would lead to direct and

> indirect loss of substantial amounts of prime agricultural land.
>
> Selection of an alternative of expansion and upgrading of US-27 would minimize impacts on agricultural lands, and would utilize an existing highway corridor which is the most direct connection between Lansing and Charlotte. Although the US-27 corridor would involve more residential and business displacement, I believe that careful design can hold such displacement to a minimum (MDOT, 1982, 3).

In so doing the MDOT is asked to consider alignments which use the existing right-of-way of US-27 as alternatives to the approved alignment. The US-27 corridor was considered earlier in the corridor planning phase and rejected by the MDOT.

In the Spring of 1981 the MDOT Commission directed its staff to develop and analyze a series of alternative alignments for a rural interstate freeway on the existing US-27 right-of-way. Six rural freeway alignments were developed. The CCAI remained active in this process as well. They wanted additional alternatives to be considered. A consulting firm was retained by the CCAI to help develop and analyze these additional alternatives. After completing their studies the consulting firm presented an urban freeway design for the length of the US-27 corridor. Later the firm combined their proposed design with the MDOT's rural freeway and offered a rural-urban cross-section option.

Under directions from the Commission, the MDOT drafted a report which covered the new proposed alternative alignments, included those presented by the CCAI consultant. In April, 1982 the MDOT received approval for a Draft Supplement to the Final Environmental Impact Statement from the FHWA. A public hearing was held on July 21, 1982 to receive comments on the document. After reviewing the comments and criticisms from the public and interagency review, the MDOT Commission selected one of the alternative alignments addressed in the report on December 15, 1982. The Commission chose a rural freeway alignment in the US-27 corridor, and it rejected the previously approved alignment. Following the decision and slight corrections in the Draft Supplement, the Final Supplement to the EIS was submitted and granted approval from the FHWA on August, 1983. In so doing the MDOT met the September 30, 1983 deadline, after which the project would no longer be eligible for the 90% federal matching funds because construction of the Interstate system was coming to an end nationally. The MDOT must also meet a September 30, 1986 date to award construction contracts for the I-69 project.

In the discussion that remains each planning phase leading to the Final Commission project decision is described with respect to the alternatives that were developed and the issues that were treated.

Corridor Selection

The corridor planning process begins with the selection of a general study area which includes terminal control points or end points for the route in question. The general study area for I-69 is shown in Figure 5.1. The control points are identified in this figure; in addition the intersection of I-96/I-496 was treated as an intermediate control point. These points were selected "...so as to maintain or improve trunk line integration and efficient travel movements." (MDOT, 1972, 27). By connecting the control points any new improvement will effectively utilize the existing Interstate system and meet current and projected travel demands.

The MDOT designed five initial study corridors within the study area. They are labeled Corridor A, B, B-1, B-2, and C in Figure 5.2. Some of the important goals which guided the development of these corridors were:

1. Serving large volumes of long distance traffic;
2. Integrating with existing and proposed trunk line highways and major county roads;
3. Serving principal traffic generators and land use features;
4. Serving the highest incidence of population;
5. Integrating with regional and local development plans; and
6. Minimizing disruption to existing ecological

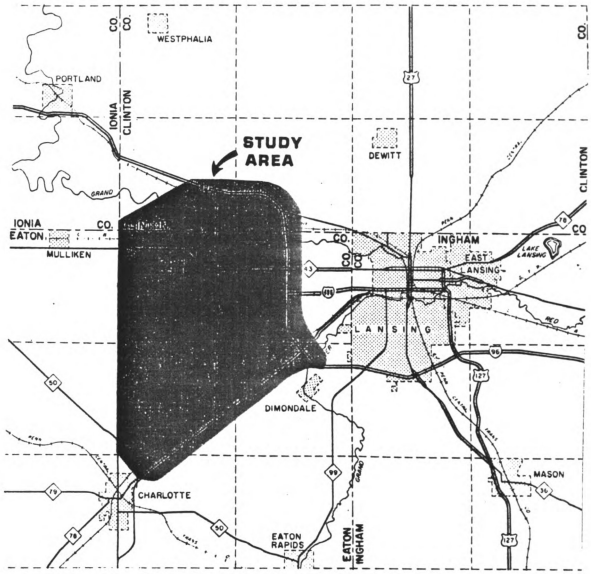

Figure 5.1 I-69 Study Area

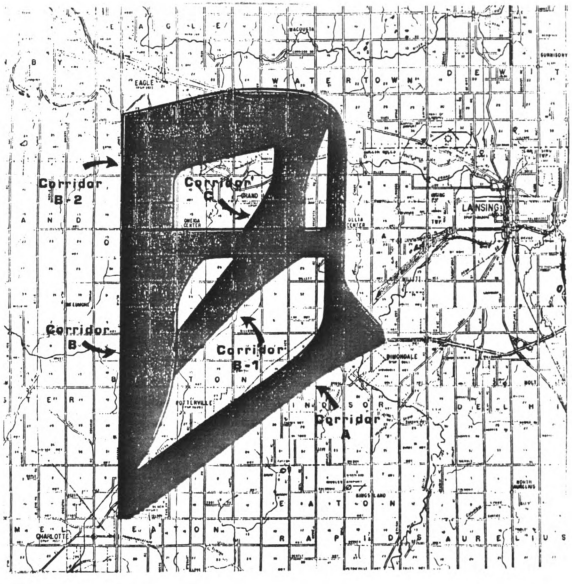

Figure 5.2 I-69 Alternative Corridors

systems (MDOT, 1972, 39).

These goals were translated into more specific objectives for the I-69 route location project. Corridors were designed to provide maximum service to traffic destined for the Lansing/East Lansing area and to through traffic demand; to integrate with the I-96 and I-496 freeways; and to consider social, economic, and environmental effects of a transportation facility.

In its preliminary discussion the MDOT found that corridors B-2 and C had significant disadvantages. While these corridors have the advantage of separating I-69 traffic from I-96 traffic, both would cost more money and treat relatively light traffic for the added distance that they require. Other disadvantages pointed out by the MDOT were that Corridors B-2 and C would also require an intersection with I-496 and would then parallel I-96 going north to the control point at Grand River Avenue. This configuration has the disadvantage of causing greater social and economic disruption on the area, as well as trapping and reducing the potential use of land between two highways. The elimination of these weakly conceived corridors was based mainly on transportation grounds. Most of the MDOT analysis centers on Corridors A, B, and B-1.

The MDOT Location Study Report combined the transportation studies of the project with the findings of the Draft Corridor EIS. It was recommended that I-69 be located in

in Corridor B. This showed the MDOT balancing transportation goals. The MDOT felt that although Corridor B was less effective in serving the high volumes of long-distance through and terminal travel demands than B-1 and C, it would do a better job in enhancing and supporting regional planning objectives. This was to outweigh the added user costs and implementation costs attributed to Corridor B. Specifically, Corridor B provided better service to the City of Grand Ledge, and it was thought to relieve the highly traveled M-43 (Grand River Avenue) on the northwest side of Lansing.

The evaluation of the corridors in the Draft EIS also came to the same conclusion; "...a final route alignment located within Corridor B will exert the least adverse impacts in relative terms upon the total environmental system of the project area..." (MDOT, 1971, 18). To summarize the findings of the Draft EIS, the MDOT felt that the corridors were relatively equal in impacting most of the environment, but that Corridor B-1 had a higher impact on the natural drainage pattern and would exert a higher impact on agricultural productivity. The determination of its impact on agriculture was due to its diagonal location which went against the grain of land parcels, and its effect on a large muck area. Corridor B had an advantage because it traversed the landscape with the land tenure patterns; that is, it proceeds north and then directly east. Finally, in the

choice between Corridors B and A, the issues seemed to be social and economic benefits and costs.

In comparing Corridors A and B the MDOT preferred the rural route with less overall impact on factors of social and economic value. Corridor A had the "...highest degree of disruption of social and economic value patterns." (MDOT, 1971, 18); the higher degree of disruption was attributable to the fact that the corridor goes along the existing US-27 right-of-way where development has already developed. Thus, it could be concluded that the MDOT selected the least disruptive corridor in considering all impacts, and also opted for the corridor which provided for more potential regional growth and moderate long-distance service.

The issue of taking of prime agricultural farm land out of production was addressed only in passing in the MDOT corridor studies. The loss of short-term agricultural productivity was mentioned, but this was countered with the notion that the land might be lost to urbanization in the near future anyway. Finally, the point was made that the number of acres in production was effected to a greater extent by the economic climate of agriculture than by availability.

In summary the corridor planning process was successful in quickly reducing the universe of potential routes to a small number by adopting one corridor. Although the analysis

was all encompassing, the topics and depth of discussion were very general. It should be pointed out that this analysis was done in the early years of NEPA's implementation, and the MDOT studies seem to be little more than what they were doing previous to the passage of the law. Both major documents, the Location Study Report and Draft EIS, were relatively short by recent standards; they were 60 pages and 18 pages respectively. The limited treatment given to the issues in the corridor planning stage of the I-69 project eventually contributed to the public debate and reconsideration of the corridor.

Alignment Development

Given the approved Corridor B in which to develop alternative route alignments, the task of the MDOT was not very difficult. By February, 1973 a Draft Alignment EIS had been prepared and ready for distribution and review. In the Draft EIS the MDOT engineers had identified two alternative alignments, and retained the options of maintaining the US-27 existing right-of-way and doing nothing. These last two alternatives were used to establish benchmarks for comparative purposes, and this had become a standard operating procedure. Both were dismissed as impractical given the transportation objectives of the State and of the Federal Interstate system. Attention was focused on two alignments for a new highway.

The discussion of environmental impacts covered the required questions as stated in the administrative regulations, but on comparative grounds, each alignment was described on a township by township basis on a small set of factors. The factors reported were length of new construction, farm acreage required for right-of-way, number of buildings removed for right-of-way, number of farms segmented, woodlot acreage removed, environmentally sensitive areas or zones crossed, distance from closest building to nearest traffic lane, and distance from near traffic lane at which minimum 70.0 dBA occurs. Where in the corridor stage the task may have been too general, it was practical in this stage to collect information and calculate specific levels of impact.

The proposed alternatives, Alt. 1 and Alt. 2, are presented in Figure 5.3. They differ in the first full mile north of Charlotte, but then remain parallel and within a half mile of each other until the corridor turns east. After the turn, the alternatives head toward the I-496 interchange with Alt. 2 about one mile south of the other. For the most part, the close proximity of the alternatives to each other reduced the differences among them. Alt. 2 was the MDOT recommendation; in looking at the impacts this alternative minimized, not only length of the route but all other factors to some degree, except the number of farms segmented. In addition the MDOT avoided a buried

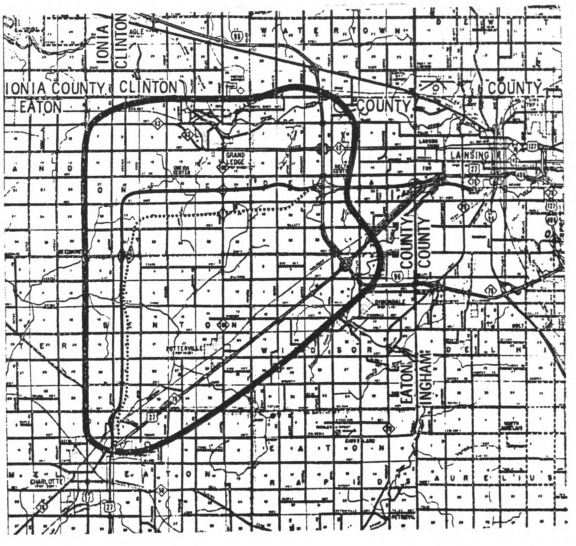

Figure 5.3 I-69 Final Alternative Alignments

outwash deposit and a navigation facility located in the northern part of the corridor by selecting Alt. 2.

Alt. 2 became the "approved" alignment for receiving federal funding. Upon completion of the planning process the MDOT proceeded to move toward final engineering designs and the purchase of right-of-way along the approved alignment.

Although it was in the alignment planning stage that the specific impacts were considered, the selection of one corridor and examining only options within that corridor appeared to have greatly reduced what was actually considered. From the public's or any conscientious reviewer's perspective, the corridor stage lacked specific information to evaluate, and the alignment stage did not leave much choice. It would have been possible to have more discussion on alignments if there was more variety in design. The decision process as carried out in this project demonstrated how a potential conflict situation was reduced to almost a technical exercise in following procedures.

It does appear that the MDOT considered environmental factors in the choice of an alignment, specifically the impact on water recharge areas. The effect of this consideration amounted to minor alterations in the alignment route, curving to avoid these sensitive areas. The larger issue of prime farm land received little assessment after the corridor decision.

Reconsideration of the Approved Alignment

In response to the public criticism and political pressure the MDOT directed its staff to develop and analyze new alignments in the US-27 corridor using the existing right-of-way. The staff reported back to the Commission in April, 1981 with its findings. There was enough evidence in this report to have the Commission request that the MDOT do further detailed studies of the new alignments. The detailed analysis became the Supplement to the Final EIS. Seven alternative alignments were examined in the Supplement, and a public hearing was conducted on these new choices. After the public hearing, all input was reviewed, and an alternative alignment was recommended. The previously approved alignment of new rural highway was rejected. The recommended alternative was selected from the US-27 corridor.

The new alternatives, in addition to the original approved alignment, are presented in Figure 5.4. In Figure 5.4 the MDOT designed alignments which were rural freeway cross sections. This alternative was considered in segments. Thus there were six alignment combinations:

A-1, B-1, C-1

A-1, B-1, C-2

A-1, B-2, C-1

A-1, B-2, C-2

A-2, B-1, C-1

A-2, B-1, C-2

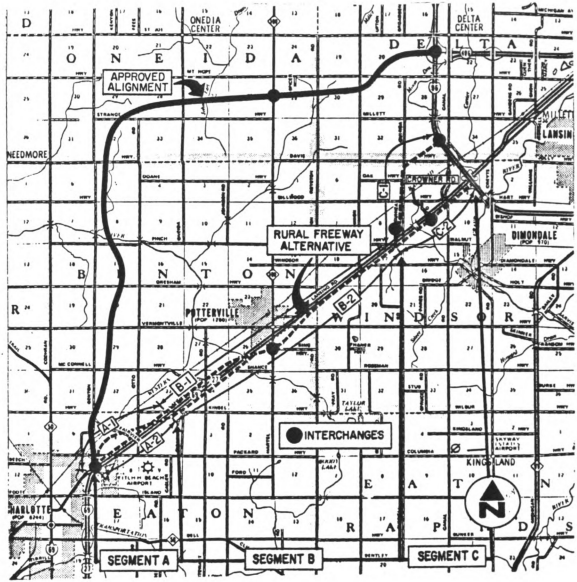

Figure 5.4 I-69 Reconsideration Alignments

The last alternative alignment covered in the Supplement was the combined rural-urban freeway which is shown in Figure 5.4. This alternative was offered by the consulting firm hired by the CCAI. The MDOT also reported that there were some alternatives which were not being investigated after the preliminary analysis. These were the rural freeway options A-2, B-2, C-1, and A-2, B-2, C-2 because their "geometrics" would yield an unsatisfactory transportation structure. Finally, the urban freeway alternative in a rural area was deemed impractical, costly, and in poor design practice. The MDOT discussion of I-69 in 1982 centered on the original alignment and these new alternatives.

First, the original approved alignment was rejected. There were four primary reasons for this decision which reflected a change in attitude from one of accommodating and promoting growth to minimizing disruption and encouraging growth near existing developed areas. Alignments using existing US-27 kept traffic and development within an existing transportation corridor. The amount of farm land required by the approved alignment was 905 acres compared to the alignments along US-27 which needs only 140 to 215 acres. Rejecting the approved alignment also favored the efficiency of servicing through travel over other factors. Finally, it was recognized that the approved alignment would have greater adverse wetlands impacts, both in terms of

acres affected and in degree. In the past the Fish and Wildlife Service of the US Department of Interior and the MDOT worked out acceptable mitigation measures for these impacts when the Service recommended denial of permits. Given that the MDOT, in its reanalysis, had other viable alternatives which avoided wetland impacts, it was thought that permits for the approved route would be difficult to get.

Second, a new alignment had to be recommended from the remaining seven proposed. After their assessment of the alternatives, the MDOT selected the alignment, A-1, B-1, C-1. The reasons given for his choice concentrated on displacement of homes and businesses, costs, tax base loss, agricultural impact, wetland impact, and construction impact. The selected alignment was significantly better in minimizing these impacts. Only in segment C-1 was a wetland impact identified and outweighed by other advantages. Mitigation measures were developed to meet the objectives of the US Fish and Wildlife Service.

The recommended alignment, that was finally adopted by the MDOT Commission on December 15, 1982, represented a significant change by relocating the proposed freeway away from prime agricultural land to a location near US-27. Although it appeared that the MDOT made many adjustments as a result of extensive public participation, it did not give in to every demand. The Commission decided on a rural

interchange in segment B-1 against local opposition which supported an urban interchange. Local interests argued that an urban interchange would take less farm land and serve their community businesses better. The Commission chose in favor of safety in rejecting the design.

Analysis of the Planning Process

The MDOT carried out a two-stage planning process in reaching a final decision on the location of I-69. By design, the process of first selecting a corridor and then an alignment within that corridor is a reasonable way to narrow down the many possible decision options. At each phase the MDOT attempted to be as comprehensive as possible in its treatment of route location issues, and an environmental impact statement was drafted and reviewed. It was evident in the description of the corridor and alignment location decisions for I-69 that the way early decisions were made affected the factors which played a part in the final choice.

The corridor location decision is supposed to be the principal place where social, economic, and environmental impacts receive attention. In the corridor analysis of I-69 there was a discussion of these impacts along with the transportation objectives of the project, but the discussion was very general. The general nature of this discussion

hindered the calculation of potential consequences, and on specific issues, the MDOT put the discussion off until the alignment phase. In contrast, there was much more information given about the transportation benefits and costs of various corridors. It was easier for the transportation factors and related regional growth benefits to dominate the discussion and eventually to be part of the MDOT decision calculus.

Environmental factors were considered during the corridor stage, but not as primary issues. Easily identified environmental factors were used to eliminate a corridor. It appeared that the MDOT used environmental factors when they were not in conflict with their agency goals. Where some conflict existed, the conflict was left to the alignment stage and an engineering solution.

By the time a project reached the alignment stage, the number of possible alternatives was greatly reduced. The MDOT offered only two alternative alignments for in depth analysis. Somehow the jump in decision level from corridor to alignment turned a potentially interesting and complicated decision into a transportation engineering exercise. The two alignments lacked differences, and the choice was based on technical design factors and cost. Specific environmentally sensitive areas were avoided where possible. For the most part, those environmental factors remaining received minor consideration, or if they happened to require

outside permits, mitigation of damage was treated and resolved.

The I-69 route location project history pointed out the problem inherent in the jump from corridor to alignment planning. Public criticism and debate finally pressured the MDOT to consider the significant tradeoff that was made in the selection of Corridor B and the construction of a new freeway over an existing roadway right-of-way. Although the MDOT seemed to give in to the agricultural interests in its reconsideration of I-69, the rejection of the approved alignment was also based on transportation grounds. The MDOT was not or did not want to be convinced that prime farm land could alone determine route choice. Finally, the preservation of prime farm land, as a policy, was given weight by the passage of the Farmland Protection Policy Act by Congress in December, 1981. This policy made it easier for the MDOT to shift the premises behind its original corridor choice from promoting growth to serving existing development and the agricultural economy of the area.

Conclusion

This description of the I-69 route location planning and decision process showed that the MDOT adopted a specific strategy to reach a project decision in order to meet its goals and comply with NEPA. The corridor - alignment, two

stage approach, is not new, but the MDOT implemented it in such a fashion as to quickly reduce the number of choices, and avoid the problem of debating the merits of conflicting policies. Not only did the rapid narrowing of alternatives avoid debate, but it kept the project decision within the boundaries of the MDOT. Specifically, it was in the best interest of the MDOT not to provide a public forum for the discussion of prime farm land policy if it could avoid it. The better able the MDOT was at shaping the choice in technical considerations, the better was the chance of project approval and compliance.

The reconsideration of I-69 pointed out what could, environmentally speaking, be gained from a planning and decision process which assesses more than one corridor or has a larger set of alternative choices. With the existence of other alternatives both the highway engineer and the outside reviewer are not locked-in to accept essentially one choice. For example, it was mentioned in the Final Supplement that the US Fish and Wildlife Service usually agreed to grant a permit for situations where environmental damage could not be avoided by the recommended alignment upon the development of a mitigation plan. If other alternatives are being studied which avoid environmental damage, the permit is not so easily granted.

One of the major implementation mechanisms in NEPA is the public participation and interagency review process.

Although procedural compliance was never an issue, critical review was weakened by the narrow discussion on technical transportation issues. The public must get involved early in the process in order to have an impact. Experience has shown that this tends to be contrary to human nature.

Finally, an overall evaluation of the MDOT's planning decisionmaking performance under NEPA shows that specific environmental features, which are mandated by protective legislation, are avoided, while less specified environmental factors do not fair well against the goals of the Department. Compliance is reduced to procedural concerns and following standard design practices.

CHAPTER SIX

Conclusions

NEPA is one of the first laws to specify an implementation mechanism which described how decisions are to be made in its policy mandate. Since its inception in 1970, the environmental impact statement (EIS) has become a given operating procedure for planning any major federal or federally funded project. Although its popularity is widespread, NEPA and the EIS have been criticized by some environmentalists as a step backwards; it diverts energy, attention, and other resources away from major environmental policy questions toward the sometimes mundane tasks of collecting and analyzing project by project impacts and decisions. Supporters of the NEPA approach cite the benefits from having some way to review and "watch dog" zealous public agencies from making narrow-minded choices which significantly damage the natural environment. Both critics and supporters alike have lacked the evidence to substantiate their views convincingly.

The NEPA mandate is a decision reform. The reform could be considered successful if agency decisionmakers adopt environmental factors in their decision premises. The

primary purpose of the research presented here is to reveal whether environmental factors are included in an agency's essential variable set derivated from its premises. An empirical investigation of one agency's record of decisions, and a case study of one project decision were conducted to develop an understanding of this agency's actual decision behavior since the passage of NEPA.

It was assumed that agencies are boundedly rational actors. Given their limited decisionmaking capabilities, agencies simplify the tasks in the decision process and rely on only a few important variables to reach a decision. The choice of these variables is determined by the implementing agencies operating in a political context. Vague mandates, such as NEPA's, which offer no solution to the controversial issues they raise, are subject to and determined by the battle of conflicting pressures (West, 1984, 341). If NEPA was successful in influencing agency decisionmaking, some environmental factors would be part of this choice set. Thus, this research began with the idea that no agency can be perfect in considering all environmental impacts. The question for which answers were sought is, are any environmental factors important to overall choice?

Findings

The empirical investigation focused on the final highway route location decisions of the Michigan Department of

Transportation. Environmental factors were found not to be very important in influencing route location if only the final alignment choice is examined. The proposed transportation facility's compatibility with the regional growth and development plans, and project costs were strong factors affecting the route alignment decision. In addition the MDOT tended to favor routes which traversed new rather than developed or build-up areas. A closer examination of the data found that certain environmental factors were in fact influential, but in the earlier design stages of both corridor and alignment planning. Because these factors were design constraintsin the process of developing the alternatives, they were consistently absent as location features of the final alignment alternatives. Those environmental factors, which were used as design constraints, are specified in specific pieces of legislation. These factors were used to identify environmentally sensitive areas and protected features which were avoided by the planners and engineers in drafting alternatives. In contrast, the ambiguity of the NEPA mandate for a general environmental policy made implementation and compliance uncertain.

The implementation strategy exhibited by the MDOT was to use the early planning decisions to foreclose the final decision options to a very small set. Final decisions were reduced to technical questions for which existing methods, rules of thumb, were available to find solutions. Problems

associated with drainage, soil erosion and sedimentation, floodplain construction, farm segmentation, relocation, and others were handled with standard practices. In so doing the MDOT retained most aspects of the project decision under its control and authority. It also limited the scope of the decision which remained outside its bounds. From the project sponsoring agency's perspective, this increased the likelihood of reaching a decision with what it considered to be the desirable results. The approach and subsequent behavior of the MDOT is not peculiar to transportation agencies, but a common bureaucratic trait to protect the organization's self-interest.

The overall effect of such an implementation strategy by project sponsoring agencies is that the general policy mandated by NEPA, to plan with the harmony of man and nature in mind, is, for the most part ignored, especially in the early planning stages of a project where its impact could be greatest. Specific environmental policies fared better. Bureaucratic behavior in carrying out such an implementation strategy used organizational processes to control the political situation where possible.

Research Conclusions

There are a number of conclusions that can be drawn from the findings of this research. First, legislating rationality, as NEPA attempted to do, through procedural

reform is assured to fail unless the requirements for this decision approach can be met. By requirements it is meant that policies must be clearly stated and operational. Experience with NEPA demonstrated that implementing agencies adopted the easiest route, that is, procedural compliance, while lacking in substantive policy.

Second, the situations in which substantive policy compliance was found, are those cases where important environmental values are protected by specific legislation. This suggests a future dilemma if every value ends up with its own law.

Third, the case study pointed out the problem associated with simplifying a complex decision. It is unavoidable that potentially good alternatives can be eliminated in early stages of decisionmaking. With respect to I-69, the corridor decision for a rural highway on a new route was not based on information which matched the significance of the decision. Decisionmakers need to weigh these preliminary decisions on a par with later ones. In addition, the decision process, if it is going to become a program or procedure, should have a way to retain variety in the generation of alternatives and analysis.

Finally, the nature of environmental policy is complex almost by definition, and it requires a problem-solving approach in implementation and determining compliance. As evident in the behavior of the MDOT, project

sponsoring agencies strive to reduce the uncertainty surrounding a policy in a way which can be counterproductive to environmentally sensitive solutions. Alternative implementation approaches should be considered which can handle error and learning in a way that can enhance responsiveness, as well as rationality.

Implementation Approaches

For descriptive purposes two "ideal" implementation approaches are offered for discussion. The first is "programmed" implementation. This approach requires clarity, precision, and comprehensiveness of policy. If some of these qualities are lacking, the implementation planner tries to: develop detailed objectives, minimize the number of actors, treat resistence by monitoring, anticipating contingencies, and using guidelines. Overall the goal is to minimize discretion at all levels (Berman, 1980, 208-9). The plan is geared toward attaining technical efficiency. The "programmed approach is similar to what others have called management control systems. In this same vernacular, "good management" has come to mean efficient control procedures. The distinction between management and control is lost (Landau and Stout, 1979, 149).

Whether it is called programmed implementation or management control, this approach is politically appealing

to public administrators. It provides the public sector with "accountability", and reduces for the administrator political liability associated with policy failure. This is all dependent on the degree of programmed implementation that is possible. Programmed implementation, or "control", has certain requirements. The most important requirement is information.

> The extent of our ability to control is,..., a function of our knowledge. An understanding of cause-effect relationships in a specified domain permits us either to produce or to prevent some stipulated outcome. If our knowledge is complete, we can do so unerringly. (Ibid.)

Thus, the ability to control demonstrates that the "means" are no longer problematic.

The second "ideal" approach is "adaptive" implementation (Berman, 1980, 210-213). It is at the other end of the spectrum. It begins with the assumption that knowledge vital to implementation is incomplete. Generally speaking, this approach allows policy to be specified, modified, and revised. Policy is adapted according to the interaction of policy and its institutional setting. It is concerned with establishing acceptable rules that allow multiple participants to negotiate and compromise during the course of implementation. This type of active participation enhances "problem-solving". Instead of certainty, policy is treated as a hypothesis to be tested. Adaptive implementation recognizes a potential for error and seeks

knowledge to clarify policy and eventually permit control. Implementer discretion is encouraged in this discovery process. In so doing, the "adaptive" approach to implementation separates, not combines, management from control. Control and management approaches to policy implementation suggest corresponding ideas of agency compliance.

Types of Compliance

Under programmed implementation, operating procedures are control routines. Compliance is stressed, and here it means sticking to rules. Any behavior that deviates from standard procedures is perceived as an error. Likewise, any exercise of discretion equals error, and all organizational effort goes to protect against error. This type of compliance is easiest to determine; "...departure from procedure appears highly visible, clearly measurable and recognizably blameworthy" (Dunshire, 1978, 99). Behavior is labeled correct or incorrect. Although this strict control notion of compliance is an extreme case, it points out an inherent problem. The problem of which policymakers must be made aware is the ease by which policy means can be transformed to policy ends. NEPA presents a good example where this could happen.

NEPA's decision process, as outlined in its administrative regulations, leads to the final informed agency decision. The product of the decision process is the EIS.

Producing an EIS can, in some instances, become "compliance". An agency just follows the content and review time requirements to the letter of the federal guidelines. Given the complexity and ambiguity of NEPA's substantive policy, more emphasis may be placed on procedural correctness than on the adequacy of the EIS as a decision document. Importantly, the hypothetical character of NEPA's policy direction can be displaced, and the discrepancies between agency activities and administrative rules can be perceived and labeled "compliance problems" (Landau and Stout, 1979, 153). Compliance would carry a different meaning if "adaptive" implementation is practiced. Under adaptive implementation the process of carrying out policy is a management process. Implementation procedures are suggested, and variance from these procedures is considered informational. The overseer learns from the behavior of the implementer, who, in turn, is learning about the policy. The assumption that the theory is right is not made. Appropriate means are sought out. On the value side, the practice of adaptive implementation realizes that imposing a change in values is not a simple operation, but it requires some negotiation. Negotiation takes place between the overseer and the implementer, and the meaning of compliance comes out of their relationship; it is a condition of the relationship (Dunshire, 1979, 23). Compliance might be described as carrying out a policy in

a "zone of acceptance", which is maintained by agreement.

While agencies are not expected to behave according to either ideal type of implementation, they can be expected to operate according to a mix of programmed and adaptive processes. The mix of processes is determined by the scope and nature of the policy and policy context. By definition adaptive implementation, which emphasizes problem-solving and learning, brings a policy's execution toward more routine and programmed activities. In areas of policy where there is adequate knowledge and a consensus on what is acceptable, programmed implementation and control can be expected to rule. Where either the facts or values are in dispute, implementation is better served by an adaptive approach and managing style. In the case of pursuing a programmed-control approach in face of uncertainty, a risk is taken. The risk is that such an instrumental approach may be unacceptable and "inappropriate for dealing with many of the broad policy issues agencies must confront" (West, 1983, 326). It constrains agency decisionmaking from learning and performing effectively in dealing with the political functions implicit in administrative mandates.

Complying with NEPA

An attempt was made earlier to discern the decision premises from the law itself and its implementing

regulations. This analysis failed to show any specific or operational fact and value premises. This is not out of the ordinary for Congressional legislation to leave the details of implementation to the agencies. It is ironic though that this is also the case in NEPA which attempts to impose comprehensive and systematic decisionmaking. Having such a general policy in a very complex problem area is not helpful to the agencies charged to implement the law. Any difficulty in putting NEPA's policies in a specified program of action leads to difficulty measuring compliance. If the implementation of NEPA is in part discretionary, determining compliance is not obvious, but the result of an understanding between overseer and implementing agency.

Given the scope and nature of NEPA's mandate, a mixed implementation approach seems most probable. Because compliance follows the type of implementation strategy adopted by the agency and approved by the overseer, the essential variable set will be composed of control factors which are easily checked and a small number of discretionary factors which are agreed on. This study found evidence for the essential variable set. It is consistent with the theory presented above that there is a greater likelihood that programmed factors from specified legislation are part of essential set, and they measure compliance; less likely for others.

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