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ABSTRACT

A workshop conducted for the New York State Department of Environmental Conservation served to orient field and central staff with a multi-disciplinary, generalist approach to environmental impact review. The program was designed to provide content input from many different environmentally-related disciplines. It was also designed to assist staff members in developing a systematic framework for a set of mechanisms for improved analysis, review, and citizen participation where actions having a significant effect on the environment are concerned. The workshop was further designed to provide the participants with an overview of facts and concepts, operational skills for the implementation of this knowledge, and increased sensitivity to problems of communication within their organization that reduce effectiveness. A summary of content input is presented, followed by core faculty statements. These statements relate to: systems analysis; ecosystems studies; sociology and environmental impact analysis; economics; the National Environmental Policy Act (NEPA); the effect of NEPA on State environmental review; and the planner as a change agent. Sample matrices, communication models, a project planning description, and bibliographic references are appended. (BL)

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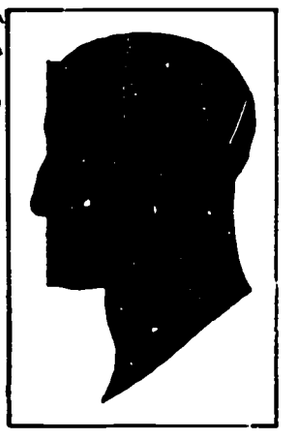

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TOWARD A SYSTEMATIC APPROACH TO ENVIRONMENTAL IMPACT REVIEW

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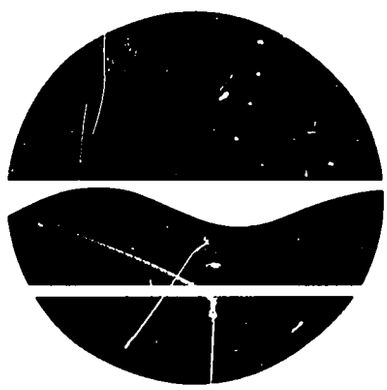

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TOWARD A SYSTEMATIC APPROACH TO ENVIRONMENTAL IMPACT REVIEW

an interpretive report.....by
The Institute on Man and Science
for
The New York State Department of Environmental Conservation

EDITED BY

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The Institute on Man and Science
Rensselaerville, N. Y.

June 1972

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PREFACE

The Department of Environmental Conservation, under the leadership of Commissioner Henry L. Diamond, has made a commitment to participate fully in the environmental impact review process. By doing so, we can thoroughly realize the opportunities provided for positive influence over decision-making that affects our human and natural resource environment.

With the passage of the National Environmental Policy Act of 1969, the new function of environmental impact review was carried out by Department personnel who were "nearest to the fire." Planners, foresters, biologists and engineers in various units within the Department found themselves spending increasingly larger portions of their time on activities relating to this mandate.

In the summer of 1971, a major step was taken toward reorganizing the Department to meet its new responsibilities. A field structure was implemented providing for nine integrated regional offices headed by an overall regional director and encompassing the major field functions of the Department including air and water pollution control, fish and wildlife management, lands and forest management and law enforcement. Moreover, a new unit, the Regional Regulation Unit was formed to assume field level responsibility in coordinating the myriad environmental analysis and related regulatory programs. A few months later, the Office of Environmental Analysis was organized to provide central office leadership and direction.

The changes were made during a period of severe budgetary restrictions, and professional staff for the new programs were transferred from other program units. Each of the twenty professionals who now work full time implementing the New York State Department of Environmental Conservation's environmental analysis program were previously specialists in a single discipline related to conservation activities. Each had selected his specialty before the current emphasis on environmental impact review began.

These "specialists-turned-generalists" are now responsible for environmental review and this is the group at which the training program, "A Systematic Approach to Environmental Impact Review," was directed. It is comprised of specialists who happened to be in a certain place at the right time rather than generalists who deliberately selected a career in environmental analysis.

From the Department's point of view, the purpose of the program was to orient our field and central staff toward a multi-disciplinary, generalist approach to environmental impact review. The program was designed to provide content input from many different environmentally related disciplines and to encourage participants to work toward an overall conceptual framework and methodology for on the job use.

Under the direction of Gordon Enk of The Institute staff and an outstanding core faculty, I believe a great deal was accomplished toward meeting this goal.

Terence P. Curran, Director
Office of Environmental Analysis

TOWARD A SYSTEMATIC APPROACH TO ENVIRONMENTAL IMPACT REVIEW

an interpretive report of the resident program conducted by The Institute on Man and Science for The New York State Department of Environmental Conservation

INTRODUCTION

Seven years ago a small liberal arts college opened its doors for the first time. The students were not only enthused by the novelty of their situation, but also they were fascinated by one of the mandatory course offerings: ecology. Few had heard the word before; fewer knew its meaning. In less than a decade this unique addition to curricula has become a household word, and environmental issues have become a part of American social life. The questions of mankind's role in relation to his habitat is one that is concurrent with civilization. During the past decade, however, the notion that man must coexist with his environment has gained wide public acceptance.

Public servants are now mandated by law and by the force of public opinion to act as vigilant protectors of the environment. The quality of life is being measured for the first time, perhaps, in broader terms than economic sufficiency. Environmental quality is becoming part of our concept of human welfare, and government, charged with promoting this welfare, must now actively engage in programs to both reverse current environmental degradation and ensure a quality environment for future generations. Since the enactment of the National Environmental Policy Act of 1969, many states have recognized the need for developing their own environmental protection programs. For New York State, the question of government's role as trustee of the environment has been given serious and intense scrutiny. On Earth Day, 1970, Governor Nelson A. Rockefeller signed legislation forming The Department of Environmental Conservation (DEC) and charged it with formulating guidelines, strategies, and goals to ensure the protection of the environment. But DEC realized that although the need for such an agency was evident, precedents for its implementation were difficult to find. The DEC, recognizing the need to develop methods and procedures for environmental review and analysis, consulted The Institute on Man and Science, Rensselaerville, N. Y. As a result, a four day program, (May 22-25, 1972) offering an orientation toward a systematic approach to environmental impact review was prepared for DEC personnel by The Institute.

The program's specific goals were to assist the staff of DEC to develop a systematic framework for a consistent set of mechanisms for improved analysis,

review, and citizen participation where actions having a significant effect on the environment are concerned. Its intent was to provide the participants with an overview of facts and concepts, operational skills for the implementation of this knowledge, and increased sensitivity to problems of communication within their organization that reduce effectiveness.

The Institute used a core faculty concept which provided authoratative background information on environmental analysis and review. The core faculty included experts in the fields of systems analysis, ecosystems studies, environmental impact statement content and criteria for evaluation, economics, sociology, environmental law, and citizen participation planning procedures. In addition, personnel from Federal and State agencies participated and addressed themselves to problems of the effectiveness of the National Environmental Policy Act (NEPA), present and future goals of DEC, and the legal problems involved in successful environmental review.

Using a task team process for group interaction, operational skills were encouraged and developed. The participants were introduced to an Information Matrix for the assessment of environmental impact that has been designed by the U.S. Geological Survey.[1] This matrix was used by the teams to review a sample Environmental Impact Statement (EIS). An Involvement Matrix for environmental assessment, which focused attention on the processes for establishing the necessary systematic interdisciplinary framework, was presented to the assembly and used by the task teams. Specifically, the teams were asked to deal with a "real world" situation in which their roles as environmental impact analysts and reviewers would be measured and questioned. The Office of Environmental Analysis (OEA) of the DEC and The Institute constructed a hypothetical planning project which the teams reviewed. This Involvement Matrix, however, has two components, one for analysis and one for education and action. The teams functioned admirably as analysts but their role as change agents was not fully realized during this process.

Environmental analysts and reviewers as agents for change, responsible and responsive to the public, was an integral concept. Through the communications process established at The Institute, the participants realized a group identity and became cognizant of their own psycho-sociological feelings of inadequacy as agents for social change. This sensitivity was a by-product of the communications process and perhaps this fact in itself is an encouraging advance to social activism. A conscious effort to improve communications characterized the atmosphere at The Institute. At the opening session, The Institute's Director of Research, Gordon A. Enk, informed the assembly that developing a communications process was as important to the success of the program as was the exchange of information and substantive knowledge. In fact, the two were inseparable.

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[1] Luna B. Leopold, et al, A Procedure for Evaluating Environmental Impact (U.S. Geological Survey Circular 645), (Washington, 1971).

The use of a behavioral scientist and material for Educational Systems and Designs, Westport, Connecticut, formalized this goal. Evening sessions were devoted to analysis of communication problems within DEC. A healthy expression of diverse opinions helped to highlight some aspects of departmental policy in need of clarification. Understanding different points of view toward matters of policy was an important contribution to an improved climate for communication. Analysis of management techniques within DEC was modelled during the discussions. Robert Dvorin, of Educational Systems and Designs (ESD), introduced the participants to a Communications Model[2] and worked with the task teams in establishing DEC's organizational profile. The participants agreed that communications within the Department should be primarily developmental, and using the task team approach, created a force field analysis of the level of developmental communication within DEC.

The enthusiasm generated by involving the participants in a task team process was evident. At informal conversations and various group activities, it was apparent that the idea of simply being at The Institute, being able to talk informally with recognized experts on environmental analysis and review, and being able to work with other DEC personnel in group problem-solving efforts was more than enough justification for the time and energy invested. In the informal conversations, individual and unit communications were discussed and, most importantly, the concept of the change agent received consideration. All knew that in addition to analysis and review, they must actively engage in educating the public and seeking citizen participation in the decision-making process. Their role as communicators between citizens and policy-makers was frequently stressed.

Participants left The Institute with a sense of having gained much in terms of factual information and ideas for improved operations, but more in terms of interaction, teamwork, and group commitment to goals. The pages that follow contain a summary of the content input including interpretive statements of the core faculty speeches, a selected bibliography, and appendices.

- M. S. B.

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[2] Copyright 1971, Educational Systems and Designs, Inc., 21 Charles Street, Westport, Connecticut. (A copy of this model appears in Appendix A).

SUMMARY

National Policy for Environmental Impact Review:

Although the enactment of the National Environmental Policy Act of January 1, 1970, mandated Federal consideration of environmental impact in the decision-making process, it was suggested by many of the participants and core faculty members that NEPA functions primarily as a planning rather than a regulatory tool. Since its regulatory functions are defined by current Federal law, its chief influence to the decision-making process is seen through its Section 102. Specifically, Section 102 states that all Federal agencies must "utilize a systematic interdisciplinary approach" in their planning. This approach must include the identification and development of methods and procedures to ensure that environmental considerations are assessed to their fullest significance. Most significantly, planning must include the preparation of an Environmental Impact Statement (EIS). Subsection (2) (C) states that "every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the environment" must include a "detailed statement by the responsible officials." The Council on Environmental Quality (CEQ) has given guidelines (April 23, 1971) on this subsection and the "detailed statement" has been interpreted to include:

i) a description of the proposed action
ii) its environmental impact
iii) any adverse environmental effects which cannot be avoided should the proposal be implemented
iv) alternatives
v) the relationship between local short-term use and maintenance and enhancement of long-term productivity
vi) any irreversible or irretrievable commitments of resources which would be involved if the proposal was implemented
vii) when appropriate, a discussion of problems and objectives raised by the Federal, State and local agencies and by private organizations and individuals in the review process

The process for preparing this EIS is also explained in the CEQ guidelines. In the drafting process, the Federal agency is required to circulate copies of its proposed environmental statement to CEQ, EPA, regional offices of EPA, State agencies which would be affected by the proposed action and private organizations and individuals. This process is meant to provide Federal agencies with relevant commentary and review of their proposed action. The agency, in its review process for the draft EIS, conducts public hearings and the recommendations of its hearing board are taken into consideration in the formulation of its final text. According to CEQ guidelines, agencies cannot take administrative action until ninety (90) days after a draft EIS has been circulated for comment and until thirty (30) days after the final text has been circulated. The final text

of the EIS is, however, subject to review. At this stage, judicial intervention and interpretation provide a system of checks and balances to the agency hearing process. Some valuable clarifications for agency procedure have been the result.

Although subsection (2) (C) is the only tangible requirement placed on agencies, the law has been interpreted to mean that agencies must study all alternatives to the proposed action. This was the major result of the recent Calvert Cliffs Coordinating Committee vs. AEC court decision. The courts have interpreted alternatives to mean all aternative courses of action that can be adopted even those that do not fall within the agency's jurisdiction. The Calvert Cliffs decision was a monumental victory for environmentalists in that it also stated that the law applies retroactively. It criticized the AEC for failing to consider its previous actions on the proposal. This "grandfather clause", or retroactive application, and the court's insistence that public opinion be part of the decision-making process have added to NEPA's power. The court decision also provided a useful clarification of the law when it declared that environmental impact statements must not simply "accompany" an application through the hearing process but must be fully evaluated by the hearing board.

These aspects of Federal law - its declaration that an impact statement be prepared, that the preparation involve a systematic interdisciplinary approach, that all alternatives be considered, that the public be fully involved, and that the environmental impact statement carries its full weight into the hearing process - form a major basis for state environmental review. There are, however, some areas in which Federal guidelines and judicial interpretation are insufficiently explained. It was pointed out during the introductory session that the language of NEPA is vague and open to varying interpretations.

During the four days of the program there was much discussion of the term "significantly affecting the environment." It was felt that some agencies were filing statements indiscriminately and also, it was suggested that some agencies, in an attempt to circumvent environmental review, would file numerous statements for various phases of a proposed project and thus obscure its overall impact from the environmental reviewer. The "cascading effect" and "threshold levels", the cumulative and synergistic effects, of several minor actions impacted on one area is an important consideration that must be read into the wording "significantly affecting the environment."

There was general agreement on another major difficulty in interpretation. The (D) subsection of Section 102 of NEPA which declares that all appropriate alternatives to the proposed action be considered was regarded as a prime duty of the EIS reviewer. It was felt that in evaluating an EIS special attention should be given to this and that the reviewer could perform a vital role as educator and consultant here. He could also, by commenting on the preparation of alternative considerations, comment on the quality of environmental analysis and on the feasibility of the project as a whole.

The call for a "systematic interdisciplinary approach" in which all alternatives receive full consideration can be seen as an attempt to help both the planning agency and the public. There is no doubt that Federal agencies are legally mandated to conduct a thorough environmental analysis of their projects. The question was raised, however, if an "adequate" analysis is also a "truthful" analysis. Professional ethics strikes at the heart of the matter and this is a primary focus of the advocacy proceeding now in the courts. The preparation of an EIS forces the agency to engage in self-criticism and although the statement is reviewed, the intent of NEPA is to urge agencies to make an objective decision that will be environmentally sound. It was pointed out that this is both the dilemma of and the reason for the review of environmental analysis. The preparer of an EIS necessarily has a vested interest in his project; the EIS reviewer must have a vested interest in the environment but he, too, is compelled to regard the project from many prespectives if he is to function as an advocate for public welfare.

During informal and formal discussions, the role of the EIS reviewer was developed at length. The participants found some difficulty in interpreting the Council on Environmental Quality guidelines. For example, CEQ seems to recognize that reviewers are not often consulted early enough in the draft state of EIS preparation. When time and money have been invested, agencies can be unresponsive to suggestions for change. This is one area, it was agreed, where CEQ guidelines could be more specific. Another problem, and one that seemed at times to be a fundamental roadblock, concerned the role of the EIS reviewer. The actual extent of his power was questioned and this concerned the distinction between the statement and the project to which it refers. The reviewer must determine if the statement has been properly or improperly prepared. Environmental analysis could be adequate but the conclusions could be misleading or untruthful. If this is the case, the reviewer must consider an appropriate course of action. It was agreed that the establishment of uniform standards and criteria would assist the reviewer in making his final decisions on the acceptability or unacceptability of an EIS.

The Status of Environmental Impact Review in New York State:

One of the fundamental questions considered during the program was the role of the environmental reviewer. Terence Curran, Director of the Office of Environmental Analysis (OEA), the unit within DEC that is responsible for environmental review and coordination, described the functions of his office. The OEA is divided into two major Sections - Operations and Environmental Review. The Operations Section serves as a clearinghouse for all major departmental permits and approvals. This section also processes environmental review documents and assists and directs detailed project review which is carried out by the nine regional offices of the Department. The Environmental Review Section prepares guidelines and procedures to facilitate the interdisciplinary review process, reviews certain controversial projects, and prepares formal and informal agreements with other State departments and Federal agencies. Either section may, for specific projects, prepare a departmental position for meetings or public hearings.

The OEA reviews a wide varity of project types including: highways, bridges, airports, pollution control plants, water supply and water management facilities, power plants, large real estate subdivisions, and projects affecting streams and lakes. Basically the Office is concerned with all "major projects significantly affecting the environment." Although, at present, there are gaps in OEA's review authority, it is expected that all major public projects and a sizable portion of private actions will be reviewable within the near future. Currently, authority for review is contained in diverse statutes, administrative orders and cooperative agreements including NEPA; Articles VII and VIII of the NYS Public Service Law; U.S. Office of Management and Budget Circulars A-85 and A-95; NYS Budget Request Manual Item 73; DEC permits and approvals; environmental hearings; Federal Water Quality Act of 1970; Federal Refuse Act of 1899; and NYS Office of General Services directives.

Mr. Curran stated in his address before the assembly that OEA has an important educative function. Because of the vast number of proposed projects it receives for review, OEA cannot provide in-depth environmental analysis in all cases. To overcome this problem, the Office should attempt to promote an environmental awareness within developmental agencies and the general public. In this way, environmental effects will be considered by the developer and the majority of projects can be reviewed routinely. Detailed review can then be limited to only those projects which are controversial or have important environmental consequences.

Mr. Curran also pointed out the need for a broader environmental perspective within the Office of Environmental Analysis and the Regulation Units in the field. He expressed a belief that more consideration should be given to the social aspects of environmental review. He pointed out that most of his staff have strong technical backgrounds and were providing excellent review of the physical environmental consequences of the projects that they were examining. However, he felt more emphasis was needed on the human environment and that one of the objectives of this training program was to orient the trainees toward broad "total environmental" approach to review and analysis. It was concluded that although OEA is a viable technical review unit, it needs to pay more attention to developing social awareness in order to function at maximum effectiveness.

The question of methodology was of vital concern to the participants and The Institute. DEC's First Deputy Commissioner Ronald W. Federsen pointed out that the Department needs standards and criteria to better equip itself in its role as consultant and adviser to project sponsors. Long before irreversible commitments are made, DEC should be able to tell the sponsor exactly what it expects from him in terms of environmental quality. If project developers know that DEC will always be looking over their shoulders then personal and corporate decisions will be forced to move out of the backroom and into public view. DEC should help both the public and project developer by setting standards and criteria for responsible environmental action.

During the opening remarks to the assembly, the legal aspects of environmental impact review were also stressed. Mr. Frank Wallace, General Counsel of DEC, provided the assembly with an overview of the legal framework under which

environmental review is authorized. He noted that there are cases in which the Department will need additional legal authority to require Environmental Statements of project sponsors and developers. He felt that the Department has established a fine record of enforcement where definitive standards and criteria have been developed. And he urged the continuance of formulation of standards for environmental quality and for environmental impact.

Wallace explained that the judicial process which is slow and costly has been successfully supplanted in DEC litigation by the administrative, quasi-judicial hearing process. He stressed the need for a professional core of witnesses within the Department who could be called on to testify as to their opinion. In doing so, the Department would gain the capability of conducting its own case. This would aid the Commissioner, who is responsible for making final decisions on environmental cases when he reviews the initial decision of the hearing officer.

A Synopsis of the Communications Process:

The legal ramifications of DEC's duties and responsibilities, the call for uniform standards and criteria, the need to assume an educative role are all important clarifications of the powers and limitations of the environmental impact reviewer. A thorough understanding of his function does not ensure, however, that the reviewer will be able to operate effectively. During the communications sessions, the underlying factors that will influence DEC's effectiveness were revealed and analyzed. The Institute hoped that by working with Robert Dvorin, the participants would develop strategies for solving their communication problems. The first step in the problem-solving process was the presentation of ESD's Communications Model. Because of their backgrounds, the participants easily adapted to the idea of ordering their thoughts in terms of a conceptual model. As Dvorin explained, communication is a process of influence. It can be defined as "behavior that results in an exchange of meaning."[3] For a manager this means that effective communication will result in positive and appropriate action.

Seen in terms of systems analysis, the Communications Model works to 1) establish a frame of reference (communication within any organization) 2) gather feedback data and 3) analyze the implications of the data. The communications framework is designed to build effective feedback loops so that organizations will have an effective way of monitoring what is happening. The goal of The Institute's communications sessions was to develop, through a group process, recommendations for improving the communications and organizational climate within DEC.

The first evening of the program the Communications Model (see Appendix A)

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3 Management Models: The Communication Process (Westport, Connecticut: Educational Systems and Designs, Inc., 1967), p. 1.

was introduced and explained. Basically, the model diagrams four methods of communication: controlling, developmental, relinquishing, and defensive. Each of these quadrants is divided into two ways in which persons generally handle this kind of communication. Controlling behavior indicates that the manager wishes to exert his influence and he generally does this by persuasion and enforcement. Relinquishing behavior implies that the manager wishes to give up some of his influence in the situation. He accomodates and complies to meet this end. Defensive behavior suggests a desire to withdraw entirely from a situation and the two methods employed are either emotional rage (fight) or flight. Finally, developmental behavior seeks, by informing and exploring, to involve others in a knowledge-sharing process.

Dvorin explained the appropriate uses of each type of behavior, but pointed out that generally, the developmental approach is the most favored by managers and employees alike. He cited studies of over 3,000 managers, professionals, and supervisory personnel from diverse areas of employment which showed that in almost every instance, a high degree of preference was shown for the developmental approach. This data was charted and compared to the results of the DEC organizational profile.

The Profile on Approaches to Communications contained twelve questions giving hypothetical examples of situations in which the kind of communication used affects the group performance. For example, one question read, "When a problem arises in my group which may result in waste, inefficiency, or other difficulties, people in the group generally:"[4] The four possible answers represented the four approaches to communication. The participants were asked to rank in order of importance from 1 to 4 first, the usual (actual) communication approach taken in DEC and second, the ways in which they desired to see it occur.

When the results were tabulated, it was shown that the participants expressed a clear preference for a developmental approach. Predictably, the defensive approach was least favored and controlling and relinquishing behaviors received similar intermediate scores. When the results were compared to ESD's national findings, it was shown that DEC rated well within the norms. It was also shown that the gap between the actual and desired approaches was almost the same as the national average. This result was of interest to Dvorin and the group because DEC is a department in transition and a larger gap between real and ideal was expected. He suggested that the consistency in scores might relate to the fact that professional roles had remained stable despite reorganization and that the group was dedicated to its service and thus making an effort toward effective communications.

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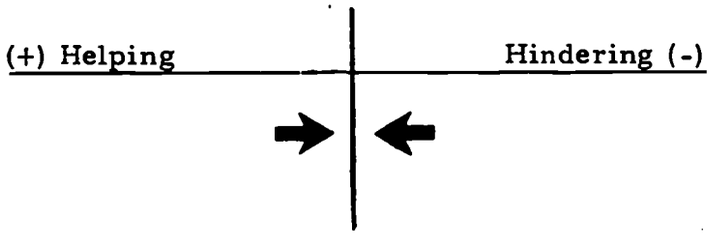
4 Profile on Approaches to Communications (Westport, Connecticut: Educational Systems and Designs, Inc., 1970).

A lengthy, probing communications session occured on the following evening. Participants raised questions as to the fundamental assumptions shared by the group. Although this was an excellent opportunity for airing opinions, it demonstrated the need to analyze communication problems with DEC and work collectively toward a solution. The following morning such an effort was made. The five task teams reconvened and discussed developmental communication within DEC. The force field analysis[5] served as their model. The process of using the force field analysis was just as important as the recommendations it produced. It gave the participants an opportunity to articulate their concerns and to understand how fellow workers viewed communication within their own units. This exercise provided the participants with a structured way of both analyzing their own thoughts and working toward a group approach to problem-solving. The group interaction process, which is the evidence of effective communication, was, perhaps, a key learning experience of the program.

Specific recommendations made by the task teams were reached by charting the forces influencing effective communications which bring about desired results within their organization. Teams listed all those factors which motivate group effectiveness and all those that inhibit it. The force field graph presented below divides these factors with a center line, a point at which optimum effectiveness will occur. The participants then decide how to move the helping forces toward the line and how to diminish resistance of the hindering forces.

FORCES TO EFFECTIVE COMMUNICATION



By structuring impressions into positive action proposals, this operational framework offers a constructive, systematic approach to problem-solving. The participants found this a helpful method and managed to incorporate into their recommendations some of the information presented by core faculty and other speakers.

The specific results of this exercise appear in Appendix B. They indicate a determination by the participants to evolve a systematic approach to both solving communication problems within DEC and establishing a framework for environmental analysis and review.

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5 Lewin, K.A. A Dynamic Theory of Personality. (Translated by K.E. Lener and D.K. Adams). New York: McGraw-Hill, 1935 and Principles of Topological Psychology. (Translated by F. Heider and Grace Heider). New York: McGraw-Hill, 1936.

The core faculty gave the participants suggestions for the analysis of environmental data, for planning approaches that include citizen participation, for economic appraisal of environmental cost and benefits, for sociological analysis of land use change, and for ways of implementing the systematic interdisciplinary approach contained in NEPA. The following interpretive summaries of the core faculty speeches illustrate the scope of the information that was made available to the participants.

CORE FACULTY STATEMENTS

THE ENVIRONMENTAL IMPACT OF THE DEC AS SEEN THROUGH SYSTEMS ANALYSIS

George Berg

Systems analysis is a grammar of problem-solving. The distinction between the system and the model of the system is the first step in the process. The system is that part of the real world which is of interest to the problem solver and, to illustrate, we shall look at the problem of water quality in the Rochester Harbor, which includes the mouth of the Genesee River and the Rochester Harbor of Lake Ontario.

The system is defined in three distinct ways: 1) by its boundries in time and space: in our case we shall look not just at the river mouth, but also at the human community in so far as it influences the river; 2) by its variables - the properties we either can control or wish to control; and 3) by its parameters - the properties we cannot change but should know about. Where does the interesting system end and the indifferent world begin? Where do the natural parameters end and our responsibilities for variables begin? Just by facing these questions we sharpen our ability to solve a problem.

The model is a conceptual device for predicting what will happen in the real world. The most useful models are taken ready-made from engineering and statistics, but the user still has to make three important decisions: (a) which model to use; (b) how to translate the event in the real world into numbers in the model (rules of correspondence); and (c) when to drop this model and switch to another one (boundary conditions). In terms of systems analysis, we have a wealth of models to choose from but only one real world to act in.

1. The first model is a simple control loop (Fig. 1). The two parts of the model are the regulated system and a regulator. Energy and matter (hollow arrows) are flowing through the regulated system, which represents here the Genesee River in Rochester near Lake Ontario, together with the sewer systems and sewage treatment plants that empty into that part of the river. Information about the state of the system flows into the regulator (this is the control input). The regulator sends orders back (this is the control output). Only messages (information) are carried by the control loop (solid arrows) in this kind of a model, while both the hardware and the energy used to collect data and to carry out the orders are lumped with the regulated system. The regulated variable in our example is the fecal pollution of the water; information about coliform count is the input. This is a model of a flow with simple feedback control.

2. Let us make a more detailed model of the regulator (Fig. 2). On the input side, we draw an information-processing unit (assessment unit). This unit monitors the regulated system; it also has a set of standards (its own information store) that say what messages should be coming in. The assessment compares with information about the way things are with the information about what should be; as a result, a demand for corrective action is produced. This goes to the output side of the regulator. There, a decision-maker unit takes the demand for

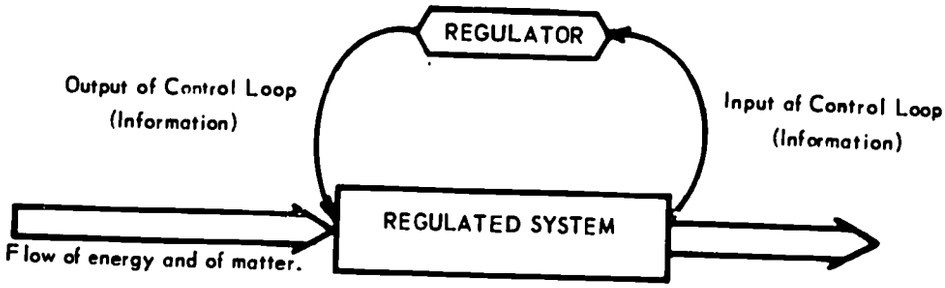


Figure 1. A simple model of regulation.

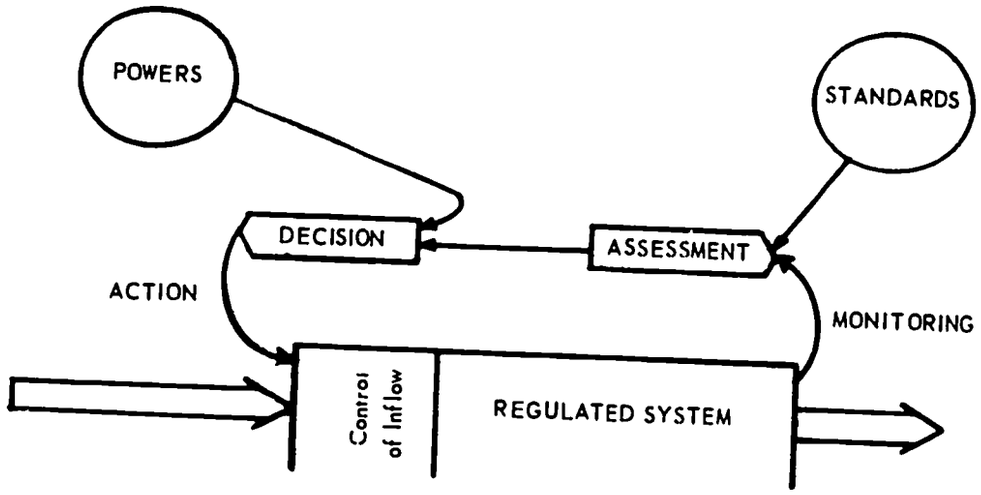


Figure 2. The functions of the regulator.

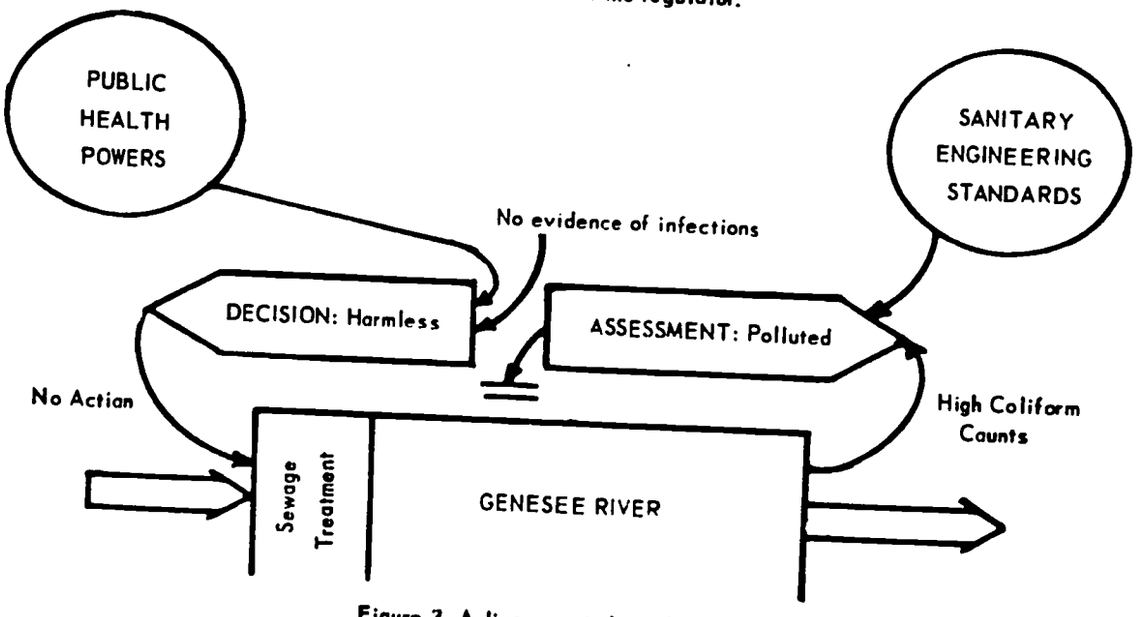


Figure 3. A disconnected regulator.

action, and draws on its own powers (laws, administrative authority, budgets) to choose a course of action. The action is an order to the regulated system, which resets, according to orders, the equipment that controls the inflow.

In the case of the Genesee River (Fig. 3) the assessment used the standards of sanitary engineering. The water was found to be heavily polluted with untreated sewage, showing that the city and neighboring towns were not processing sewage as the standards required. The demand for action, however, got nowhere. The decision-makers at the County Health Department were given powers of action on public health but no direct power over water quality. They were not receiving a demand for action on public health - no one was reported ill with disease traced to dirty water.

Using system analysis helped. I found the roots of this problem. The health officer was not a villain; he had the wrong powers. The manager of the sewage treatment plant was not incompetent; he had no budget for expansion or repairs. The control system set up by law was defective. The decision-maker was given one professional task - the prevention of epidemic disease, but the regulation that was needed had little to do with this. This is an excellent illustration of the need for interdisciplinary control of environmental problems.

An interim solution was established in 1965. A working control system was temporarily put together which produced the Pure Waters program of Monroe County. In terms of Figure 2, the assessment of water pollution was made by the Rochester Committee for Scientific Information, and the demand for action was transmitted directly to the voting public by the Committee and by the Conservation Council. The public, then, acted as the main decision-maker, drawing economic power from Governor Rockefeller's new Pure Waters bond issue. A County Pure Waters Agency was set up with a half-billion dollar budget; the most polluted beaches were closed to bathing. This approach illustrates a rule: the most professionally elegant and administratively well defined control system is useless if one of its internal links is jammed or missing. A hastily assembled, poorly defined control system is fine - while it works.

A new control loop has now been assembled (Fig. 4). The Department of Environmental Conservation is its main component, though it works largely through the County's Pure Waters Agency and Health Department. The regulator has adequate standards, powers and connections. It is accomplishing much good in Monroe County. Yet, the river system we are discussing is not regulated at all. Fecal pollution comes into the Genesee just as it did before. We can analyse this failure by modeling the flow of information in more detail.

3. When living organisms gather information they do not function as passive receivers. They search information out and adapt their search to their need. Organizations also function adaptively. Models of adaptive information-processing can be drawn from theories of learning and from doctrines of military intelligence. There would be a separate model for each part of the control loop. We will look at the adaptive control of monitoring (Fig. 5). The Department has an

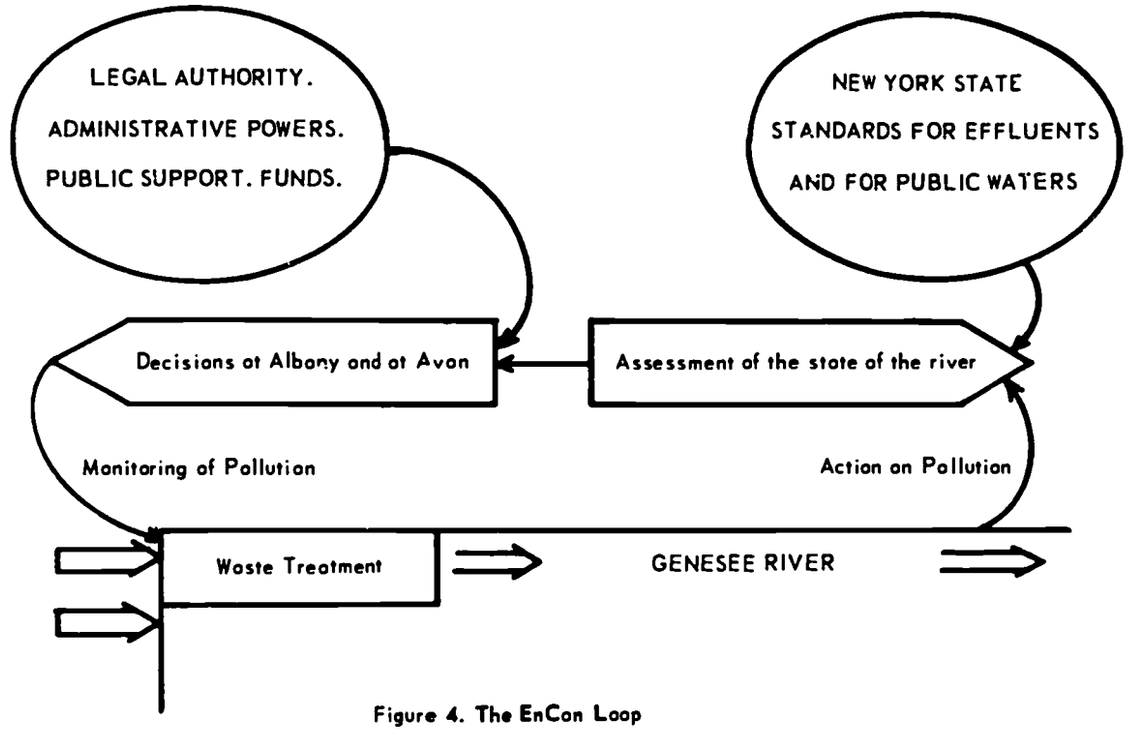


Figure 4. The EnCon Loop

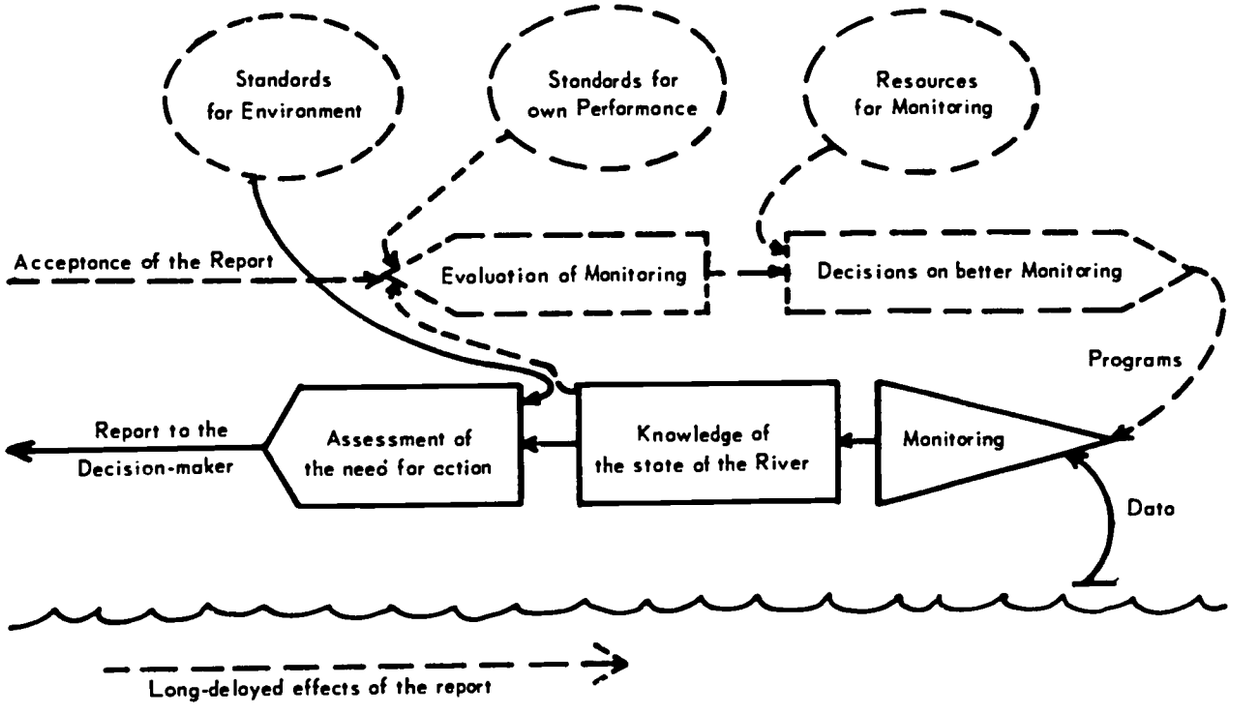


Figure 5. An adaptive monitoring system with inadequate feedback.

organization for monitoring the Genesee River. Information about the state of the river is printed out automatically ("real time") and stored in Albany. As in the previous model, this information is used to prepare demands for action, aimed at the decision-makers. In this model, however, we also show what is done to manage and improve the monitoring process. The Department evaluates what was accomplished, draws on its own standards and resources, and decides what information can be and should be obtained next time. When the whole adaptive process works well, the monitoring system gives the decision-makers just the information they need; has the information ready ahead of trouble, and does all this with no waste of effort.

Some monitoring systems of the DEC seem to work well: the Environmental Radiation Survey of the Bureau of Radiological Health Services is an example. By contrast, the surveillance of water quality is working badly. For example, (a) the volume of data for 1965-1967 was not distributed until 1970; (b) the untreated sewage poured daily into the Genesee in violation of the law is still being recorded as a legally permissible "storm overflow"; (c) decisions on building an intercept or system are currently stalled. What can be done to help the system improve its own performance?

4. One remedy available at next to no cost is to add an outside review that will help the monitoring agency to monitor itself. (Fig. 6). In the case of the Environmental Radiation Survey (a) the records of measurements are copied and distributed every few months to an open list of subscribers; (b) every quarter, a brief report summarizes the results, and provides a timely and authorative basis for official action; (c) every few years, the program is covered by a paper in a scientific journal.

DEC gains public trust and expert advice in this way. Also, the procedure helps to keep the monitoring program lean and fit.

The decision-maker served by the monitoring program must be a professional politician, representing the public's desires and interests. The head of the monitoring program must, by the same token, be a professional scientist as well as an expert communicator. In systems-theoretical terms, he provides three skilled services for the decision-maker: (1) a ballast of technical knowledge; (2) a filter to take out misinformation and other noise; and (3) a decoding interface between the technical language of data and the compact language of action. It is only too easy to let these skills decay. When this happens, the head of the monitoring program either goes unheard or becomes an echo to his chief. As a result, the whole regulating system malfunctions. Sometimes it becomes "jittery", and over-reacts to trivial inputs. An example of "jitters" was seen in the selection of a series of sites for solid waste disposal in Monroe County by the Environmental Facilities Corporation. At other times, it fails to use available information and becomes misdirected.

The DEC can be modeled as a complicated control system that adjusts continuously to its tasks. It adapts best when the information it collects is promptly presented to the academic and civic communities.

FIGURE 6. An adaptive monitoring system designed for optimum performance.

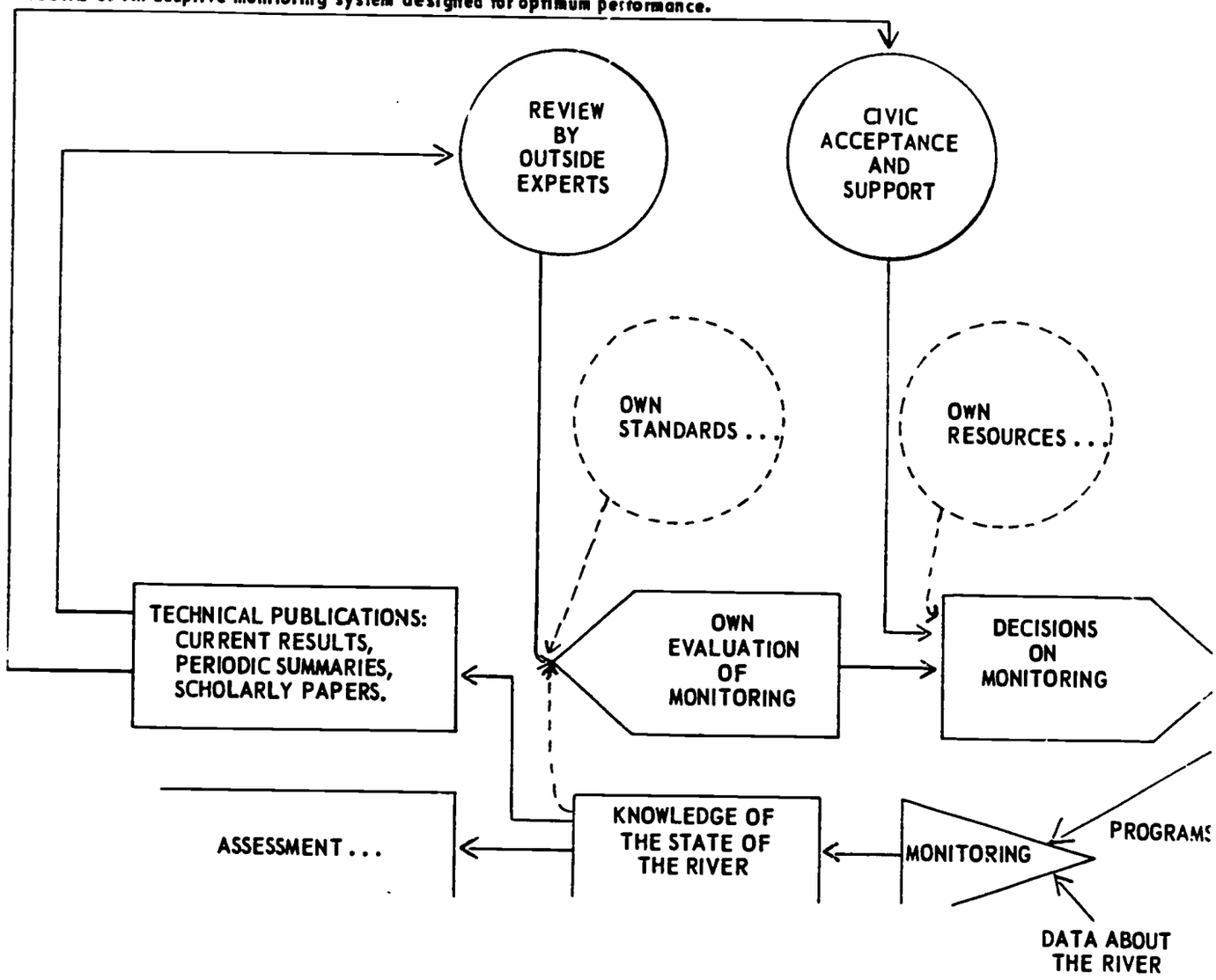
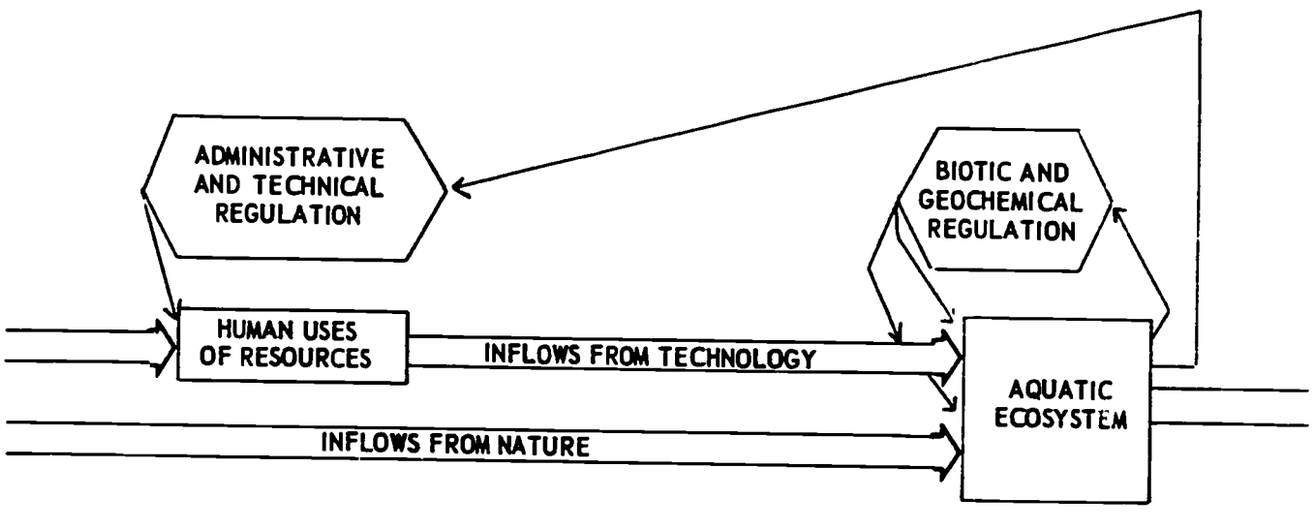


FIGURE 7. Division of labor in regulating an ecosystem.



5. But it is only one of many regulators of the Genesee River. The river is influenced by the human community on its shores and by the organisms that live in it. A simple model represents the whole system in two parts: the natural ecological system, and the technology that interacts with it (Fig. 7). We need such a model if we want to ask how to choose the standards that will be enforced by the DEC.

The closer an ecological system comes to a climax condition, the more regulating it can do on its own. The more we disturb it, the more we must depend on expensive technology for regulation. Environmental conservation calls for standards that are high enough to allow natural ecosystems to regulate themselves.

The regulating performance of the DEC depends in a critical way on understanding the system and on the flow of information about the state of the environment to the Department's decision-makers, the academic community, and the interested public.

ECOSYSTEMS STUDIES

Robert S. Dorney

Either Land Capability Mapping or Biogeographical-Ecosystem Mapping can provide the state and counties with low-cost, simple, highly effective planning tools. For example, a 3-step agricultural capability mapping shows what areas are suitable or unsuitable for farming and where the permanent farming population should be encouraged. A 3-step recreation capability map would show what land and water areas could support high quality leisure time facilities of either an acceptable or unacceptable nature. Public interest and community groups find capability mapping helpful and easy to understand, and can be prepared at a cost of $2,000 per county if 1" to 50,000' scale maps of these features are available. By overlaying these maps interaction between resource features can be depicted, an approach demonstrated in Design with Nature, by McHarg. More sophistication occurs when we begin to classify land around soil types, the biogeographical approach of Crowley.

Biogeographical-Ecosystem maps which begin with regional geology, and then relate the soil types to this geological area, and then the vegetation and the animal life to the soil type can show thousands of variables related to each soil type in the form of a computerized data bank. From this source, information can be obtained on various projects for resource managers as quickly as it is needed. In addition, planning consultants interested in highway location, hydro-electric line location, and regional boundary issues can find this type of data system a very simple and direct service. At a cost of $30,000 per county to translate and code the soil information into productivity, economic, engineering and wildlife terms this approach is reasonably low cost.

Biogeographical-Ecosystem mapping does, however, have a limitation in terms of scale. Since the scale of most soil mapping is 1" to 1400' the computer bank contains insufficient soils and geographical information for subdivision design work. An Ontario developer using similar scale maps found no construction limitations indicated for soils at the scale of 1" to 1400'; but upon further field investigation at a scale of 1" to 400', serious geological problems of slope slippage were found that would make the construction site inappropriate. The geological misinformation that was corrected by detailed mapping indicates that site or project design for housing needs the more detailed field mapping to avoid such costly errors. It is advisable when checking urban subdivision designs to have people in the field. Local expertise, such as could be found in former farmers, naturalists, etc., can be very helpful in the information gathering process.

Another problem of ecological site planning, especially of concern for DEC, is the initiation of the consultation process at the proper phase of development. The necessary resource information must be received as early as possible before design engineering begins because resiting and replanning will be costly and the client resistant to new resource inputs.

In ecological planning, alternatives must be suggested and threshold effects identified early in the game for them to be given maximum consideration. The identification and analysis of such threshold effects are always difficult for the field biologist, but if missed can be costly and damaging. (For example, placing one additional road crossing where it will warm a trout stream too much in summer or destroy the best spawning areas.) By calling in local experts to help in the analysis of threshold effects, we can receive better information and catch some of these situations.

Interdisciplinary approaches involving field studies (Fig. 1) can help present the ecologist with a fuller view of a project impact. Historical and scientific data compiled and translated by a communication specialist so that the client and public who need to be informed can understand the analysis is one aspect of this work often overlooked. Often, this failure to create an interdisciplinary team and to have its findings translated into a common language creates serious roadblocks to effective ecosystems analysis and communcation of findings to the client or public.

It is unfortunate that the problems of scale, of phasing, and of communications can prevent the fullest use of ecosystems analysis because we have found that the savings created by such research are substantial. I have stated recently that our experience has shown that for every dollar spent on ecological advice by developers, banks or insurance companies between $5 to $20 in reduced costs or savings would be demonstrated.[1] In our impact studies of the projected alterations of farmland into a new town site, subdivision and an urban park, for example, we have found substantial monetary savings (Fig. 2). If the park study had cost $10,000, the overall benefit to cost ratio would have been 15 to 1, certainly a considerable figure.

Impact studies on ecosystems, if they are done at the appropriate scale and the right phasing, can be a critical tool in project planning and site development. Savings come primarily from the appropriate soils and geographical data; however, we have not been successful in the past in convincing clients that geological surveys can be a major savings. The DEC through the Environmental Impact process could not only emphasize the conservation benefits but the cost benefits if adequate field studies are carried out before a great amount of design or engineering analysis is begun on a project utilizing the interdisciplinary talent in DEC, State Science Service, universities, consulting firms, and the local community.

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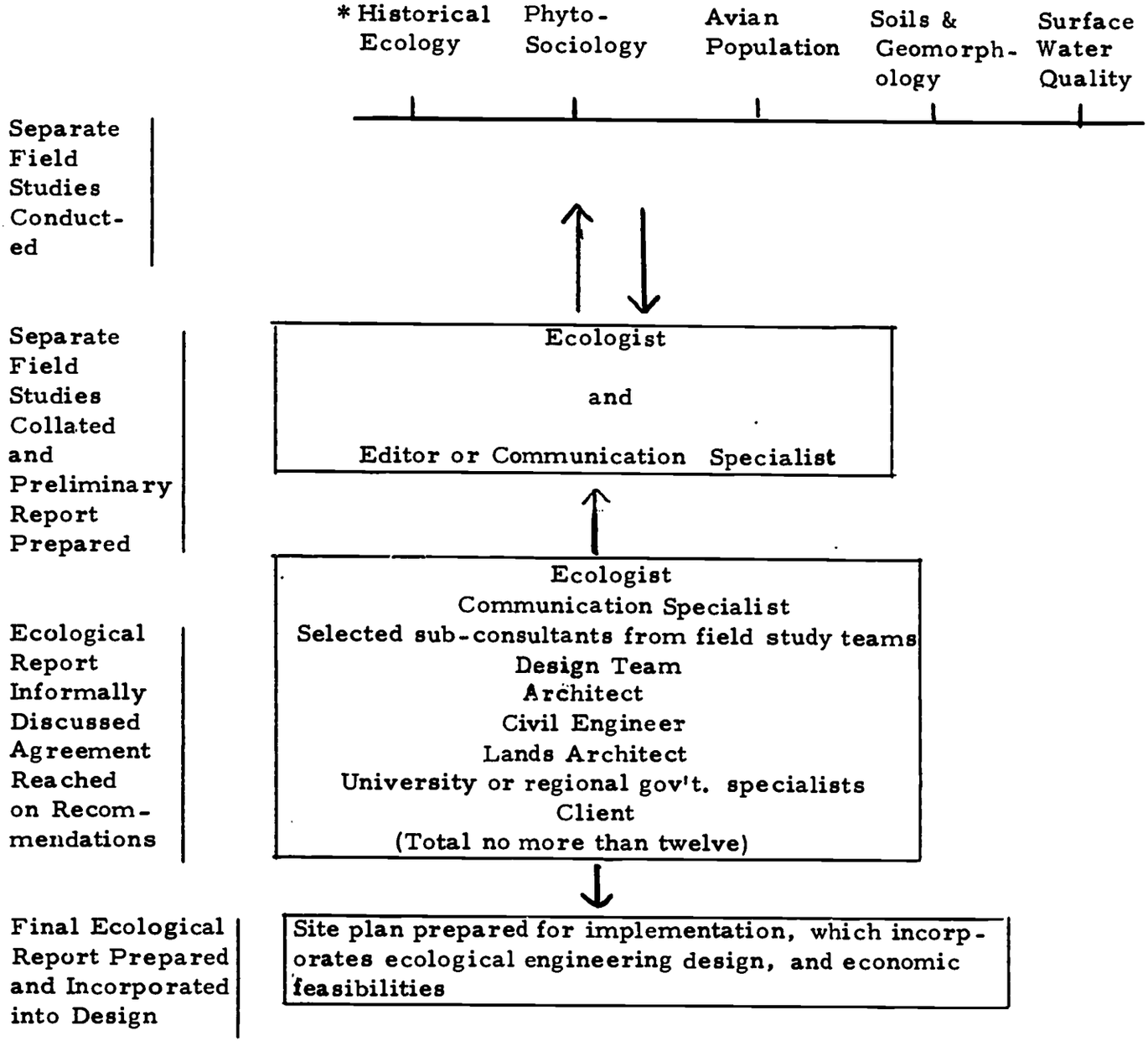
1 R. S. Dorney. "Role of Ecologists as Consultants in Urban Design." (Presented at a Symposium entitled "Urban Ecology Today," Co-Sponsored by the Ecological Society of America and The Wildlife Society, AAAS meeting, Chicago, Dec. 1970), p. 17.

Figure 1.

SCENARIO FOR PREPARING AN ECOLOGICAL REPORT ON A NEW TOWN OR CAMPUS SITE



*Early vegetation, history of Indian and settlers, use of land and water resources, and unique cultural features of the region and the site.

Figure 2.

SAVINGS GENERATED BY RESEARCH AND CONSULTING STUDIES* ON ECO SYSTEMS TO BE MODIFIED

	Ecosystem Analysis Cost	Approximate Saving
New Town	$21,000	$300,000-$500,000
Subdivision A	$ 2,500	$ 16,000
Subdivision B	$ 800	$ 30,000
Subdivision C	$ 500	$ 10,000-30,000
Park	None**	$ 50,000

*Ecoplans Ltd.
**Done by graduate class

SOCIOLOGY AND ENVIRONMENTAL IMPACT ANALYSIS

Kenneth Wilkinson

There is a real need to apply the tools of sociology, the social science that deals with "people problems," to the area of environmental impact analysis. Although there is certainly a need to include sociology in the list of environmentalist skills, it is necessary to realize that sociology as it applies to environmental studies has certain limits. If we see an overview of the field of socio-environmental studies, then we'll have a better understanding of the ways in which the sociologist can contribute data to a thorough study of the environment.

There are some areas of sociological research that have always dealt with the environment. Agricultural development and rural sociology which has studied, for example, why some farmers adopt some practices and others don't, is an old and widely used discipline. On a more comtemporary basis, sociologists have studied the factors underlying forest fires in the South and West to determine the aspects of local community organization which seem to inspire high rates of incendiarism.

Man's behavior in times of natural disaster and the psychic effects of leisure time behavior have also been areas of investigation. The effects of weather modification and forced migration of population are also of interest. The action of community groups in the decision-making process and in public opinion on matters such as pollution has also been studied. Also, within sociology there is study of the environmental movement itself. Among the very latest interests in sociology are ethology, concerned with a naturalistic society, and an old interest made new, human ecology.

In summary, the sociologist of the environment finds himself dealing with three major areas of emphasis:

1) Man's impact on the environment
2) The effect of the environment on man
3) The process of social action regarding the environment

Man's impact on the environment can be seen through the problems of urbanization, industrialization, population growth, technological side effects, and even the Bomb. Man controls the effects natural resources have on society through a system of social costs and benefits and through the social consequences of land use. The environment affects society dramatically in the case of a natural disaster and pervasively in the entire range of functioning or organizations, citizens' groups, voluntary activists, etc.

These are the areas in which a sociologist can contribute to the understanding of environmental issues, but I would like to suggest to you that the sociologist

can also raise some important questions about issues which must be recognized and remembered. Perhaps the most important is the "myth" of the environment which separates the "inside" from the "outside". There is a linkage of attitudes and institutions; persons and groups are open systems, and the ecological field cannot exist without total functioning. A second and vastly important issue is the question of intervention and social welfare. Nature is a conservative force but man in his social makeup strives for change. We see this dilemma in the way communities are disrupted through social change. This is a form of environmental impact too. We must realize that human development versus natural balance is a problem and that there is an urgent need for a systematic view of the criteria of human welfare as a basis for evaluating "impact." I would suggest a four-fold model of the social conditions for human welfare consistent with the demands of nature:

Liberation
1) Economic sufficiency to overcome deficit needs
2) Technology to release effort for pursuit of human ends

Humanity
1) Justice and equity
2) Community

In closing I would like to stress that such concerns should be the basic matrix for action. Our organizational strategy for human welfare must look to these values and must consider that the government on an agency level can do relatively little, that policy planning and political dynamics go hand in hand, and that, in the development of a collaborative strategy we must be sure to properly define our mission and to provide the services and resources to the groups we serve.

ECONOMICS AND THE ENVIRONMENT: A PARTNERSHIP FOR CHANGE

Gordon A. Enk

NEPA, seen as an attempt to reorder the priorities of Federal decision-making, would quite possibly provide a balance between environmental and economic considerations. Environmental values can be raised to a significant level of importance and traditional economic concerns reappraised by the expertise of the natural resource economist. Economics and ecology have been viewed as being inimical pursuits. It has been erroneously argued that because the economist does not traditionally stress option values, our aesthetic and ethical value standards of environmental assessment, he cannot properly understand the choices involved in environmental impact analysis. In fact, economists have acknowledged the importance of this area,[1] which is rightly the province of psychologists, sociologists, and philosophers. Ethics and aesthetic considerations are tangential to the economist's province and do not negate his role in affixing cash values and establishing values in exchange. For example, he cannot measure the "metaphysical" value of a clean stream, but he can establish its cash value. If someone is willing to pay more money for a homesite with a clean stream, then that cleanliness has a cash value. Likewise, if someone chooses to accept cash in return for the continued right to pollute that stream, then the value in exchange can be measured. This adds to our knowledge of the "real world" impact of environmental aesthetics.

If we can reject the fallacious argument that because the economist can name a determined market value he is automatically exploiting it, then we can begin to understand how the study of economics can increase our efficiency and effectiveness in managing natural resources. Economics begins with the assumption that scarcity is a fundamental condition of living on the earth. We do not have and cannot ever have an overabundance of every component of human existence. The economist accepts the fact that we deal with this by trading off one valuable commodity for another of greater value. For example, if we decide that leisure time is more valuable than a larger income, we trade a portion of the larger income for the scarcer leisure time. Scarcity can occur in terms of time, money, amenities or natural resources. As economists develop the concept of natural resource scarcity, a distinction evolved between renewable and non-renewable natural resources. A non-renewable resource is a stock resource and the stock is defined by the state of technology at any given time. The stock of many non-renewable resources has been increased over time by technological change. The impact of the Taconite Process

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[1] Krutilla, John. "Conservation Reconsidered," American Economic Review, Vol. LVII, No. 4, (Sept. 1967), pp. 777-786.

upon iron ore production in the Mesabi Range and The Trans-Alaska Pipeline in which advanced transportation technology increased the available supply of petroleum are examples.

One major study of the effect of consumption of renewable and non-renewable natural resources was conducted by Harold J. Barnett and Chandler Morse.[2] Their historic overview of the economics of natural resourse availability from 1870-1957 offers a comprehensive transition from the past to the present by showing how technological progress has changed classical economic thought on natural resource availability.

Their basic assumption was that a belief in increasing natural resource scarcity as it applied in the classical world (the work of Malthus and Richardo) does not necessarily imply belief in the inevitability of diminishing returns in a modern world of wide technological capacity. They established a hypothesis to test the classical assumption of increasing scarcity. It stated that, despite technological progress, the economic quality of resources would decline. They tested this against the changes in the costs of extractive output (the only reasonable way of measuring natural resources themselves) and found that over the period 1870-1957, the evidence for decreasing returns was:

1) negative for agriculture
2) negative for minerals
3) negative (positive from 1870 until 1929) for forestry
4) negative for total extractive output

Their findings showed that the hypothesis failed and that technological progress must be positively considered in a vew of natural resource scarcity.

A very recent study commissioned by The Council of Environmental Quality, Environmental Protection Agency, EPA, and the Department of Commerce[3] examined another set of environmental questions. The authors of this study assumed that if the theory of finite natural resources can be questioned and found faulty, then the assumption that pollution abatement will be economically disastrous can also be held to closer scrutiny. In this study economic estimates are predicted for the future if current pollution control standards, in air and water abatement specifically, are met. Projecting pollution control costs over

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2 Barnett, Harold J. and Morse, Chandler. Scarcity and Growth: The Economics of Natural Resource Availability. (Baltimore: The Johns Hopkins Press [Resources for the Future, Inc.], 1969).

3 The Economic Impact of Pollution Control: A Summary of Recent Studies, Council on Environmental Quality, Department of Commerce, and Environmental Protection Agency, (March, 1972).

a period of five years (1972-1976), the study estimated the microeconomic impact on eleven industries, including cement, paper production, petroleum refineries, and steel making. A macroeconomic survey predicted the economic effects over a wide spectrum of national economic life for 1972-1980. The results of these led to the conclusion that estimated pollution control costs would not severely threaten the viability of industry and that "the national economy would not be severely impacted by the imposition of current pollution abatement standards."[4] The impact, however, would not be inconsequential.

The studies indicated that compliance with environmental regulations would result in some price increases, probably a rise from 0% to 10% over the period 1972-1976. Average annual increases would be 0% - 2%, and it is expected that the major influence would be felt in 1974 and 1975. Of the 12,000 plants currently operating in the industrial activities studies, 800 would probably close under normal circumstances between 1972-1976. Perhaps an additional 200-300 will close because of pollution abatement requirements. It was felt that these closings would occur in plants that were operating marginally and vulnerable for other reasons. It was also found that job loss attributable to environment regulations would range from 50,000 to 125,000 over 1972-1976. This is approximately 1% to 4% of the total employment in the industrial activities studied in these industries. The average annual unemployment would be .05% of the 1970 national total work-force.

The impact of pollution control costs on the national economy fell mostly in the areas of higher product prices and demands for industrial investment in pollution control equipment. It was felt that the rising prices would outweigh one impact of investments and that without compulsory economic policies, macroeconomic growths would be retarded. Measured against a baseline projection for full employment, the impact of pollution control costs is this:

1) constant dollar GNP grew more rapidly in 1972 but fell below the baseline in 1973 and remained that way throughout the decade.

2) annual rate of GNP growth averages .3 percentage points lower from 1972-1976 (5.2 to 4.9) and .1 percentage point lower over the decade (4.8 to 4.7).

3) fixed investment prices rise at an annual rate of .5 percentage points above the baseline.

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[4] Ibid., p. 11.

4) consumer price index increases by .2 percentage points annually from a baseline average of 4.0 per year.

5) unemployment rate .1 - .2 percentage points higher from baseline average of 4.6.

Inflationary pressures would ease by 1976 and, at the end of the decade, prices would rise at a lower rate than indicated in the baseline figures. It was felt that as the excess capacity of the economy increased, incremental pollution control costs would decline in significance. So far, those who have analyzed the economic costs of the environmental sensitivity NEPA mandates have given us cause for optimism. The job of balancing the benefits of responsible environmental actions against the costs of pollution abatement can be done. Those of us who are charged with this task must "reeducate" the thinking of decision-makers and enforcers, and certainly, the natural resource economist can provide credible data for this purpose.

THE NATIONAL ENVIRONMENTAL POLICY ACT AND ENVIROMENTAL IMPACT STATEMENT ANALYSIS

Bruce B. Hanshaw

Prior to passage of the National Environmental Policy Act (NEPA), simple economics ruled every project. With the advent of the NEPA, decision-makers were given information on the environmental costs and benefits of the proposed action in order to weigh them against the economics. The 102(2) (C) process of this law thus provides a means to display the true costs, both economic and ecological, of projects. Hopefully, NEPA provides us with a balance between economy and ecology.

We analyzed 200 of the 2388 impact statements filed with the Council on Environmental Quality through January, 1972 in order to see how thoroughly the potential of 102 is being realized. We concluded that for most Federal agencies the act of filing an EIS is regarded as simply another licensing procedure. We also found that agencies granted action on all 200 statements, thus enforcing some people's concept of 102 as simply a routine procedure. Of the statements studied (all of the drafts), 127 cited "adverse environmental effects." Of these, 214 alternatives were provided and rejected, 130 for economic reasons, 47 for environmental reasons (alternative worse), and 37 for engineering reasons, which I suspect to be economic in reality. In other words, 167 were rejected for economic reasons! The EPA was asked to respond to 56 of these 200 statements. Of these, 27 were approved without change, 24 received no comment, and 5 were commented upon with suggestions for improvement. It should be noted that CEQ seldom comments on the EIS's and reviews them in depth only if there is public concern.

Although we found, in our study, a definite problem in terms of manpower capability and quality of reviewing, there are other problems associated with 102. In a review of EIS, we found that DOT files the highest number of EIS; most of these are brief statements on small portions of highway systems or on airports. We are also concerned about all the "minor" projects for which an EIS isn't required. The cumulative effect of these in one area could be environmentally serious. The definition of a "minor" project leads us into another problem with the entire NEPA process--the ambiguity of its wording. Such phrases as "major Federal action", "the human environment", "to the fullest extent", "alternatives to proposed action", "significant impact", "highly controversial", and "systematic interdisciplinary approach" provides major problems of interpretation. The way in which each agency or person involved in the 102 process interprets these phrases will influence the 102 process.

The vast majority of 102 statements do not adequately cover social impact and human elements. Likewise, the review process currently is totally inadequate in providing means for involving the public. For example, it may take a private citizen or group as long as 75 days to acquire a statement on which it would like to comment. Note the guidelines required comments generally within 30 days

of filing with CEQ. I would not wish, however, to see NEPA go back to Congress for amendment, but I would suggest expanding CEQ from its present 30 member staff, have them provide better guidelines, interpret the ambiguous language, and provide for easier and faster public access to statements. The EIS process and its review would then be greatly improved. Furthermore, I suggest that the establishment of an Environmental War Room, where all current projects would be displayed, would focus attention on any potential conflicts. For example, consider the situation that exists near Washington, D. C., where one Federal agency decided to build Dulles Airport in a rural, unpopulated surrounding in order to prepare for future transportation needs while another agency helped to build a housing development on surrounding land. Residents now complain about aircraft noise. This might have been avoided had such a War Room been in effect.

Another suggestion, already touched on, would be to provide for better reviews of EIS at the draft stage, especially involving the public. The earlier the review process can start, the quicker major problems in the EIS can be discovered and solved. Also, we believe that EIS preparation and reviews might be better accomplished by means of a systematic approach such as that provided by an impact evaluation matrix (see USGS Circular 645 as one example). In this type of analysis, I do not favor using cumulative point rating systems because such techniques are open to the criticism of point-adding or -sharing and encourage subjective analyses. I think that the use of a matrix such as that in Circular 645 and of our flow chart (Figure 1 in Circular 645) will provide reviewers with a comprehensive method of analysis. He can then compare his findings with those of the EIS preparer. Finally, it is imperative that both the reviewer and the preparer have on-site knowledge of the project.

In conclusion, the NEPA has had significant influence in making the decision-makers and the public better aware of the environmental costs and benefits of proposed actions. Careful preparation and review is needed to provide adequate and complete impact statements. Information matrices such as that suggested in Circular 645 can be useful tools to achieve that end.

THE EFFECT OF NEPA ON STATE ENVIRONMENTAL REVIEW

Robert Kafin

It is easy to treat NEPA as an elaborate scheme for playing meaningless games. My purpose will be to try to bring our discussion down to earth. I'd like to examine the role of the state within the review powers of NEPA. A simple reading of the statute will not provide much insight. The statute says that Federal agencies proposing action must prepare an environmental impact statement after consultation with other Federal agencies to be commented upon by Federal, State and local agencies and the public and to accompany the proposal through the existing review process. The flesh for the NEPA process comes from sources other than the bare words of the statute. These are four sources of particular value - Executive orders, CEQ, individual agency policies and court decisions.

Executive Order 11514 directed Federal agencies to share information and actively encourage participation from the State, local government and the public. The CEQ through its NEPA guidelines set up a more detailed timetable for impact statments suggesting a process of agency draft statements at the start of the agency review processes and a final revision at the end. It also made the distinction between consultation with other Federal agencies before preparation of the draft statement and comment afterwards. One can also look to individual agency practice for additional guidelines. Finally, the courts have given us their interpretations of what it is the law actually requires us to do. It is from these sources, rather than the wording of the statute, that we find in understandable detail the NEPA mandate.

There is no legal requirement in NEPA for the states to take any action on Federal environmental impact statements. The law requires that the Federal EIS should be circulated for comment but except in some limited instances, such as water quality and A-95 review, there is no requirement for the States to do anything. In addition, the Federal highway system has delegated its EIS functions to individual states but I am not sure that this is a permissible delegation under the law. By and large, however, the State role in NEPA thus becomes a question of policy rather than law since there is no legal requirement for State paricipation. I feel that NEPA provides a splendid opportunity for State governments to become involved in influencing the federal decision-making process and this should be the reason the policy for states to comment meaningfully on Federal impact statements.

If this is to be the policy, then the State ought to get involved as early as possible. Thus, even before any draft statement is available for comment, it might be appropriate for the State to insist that it be consulted in connection with the preparation of the draft. This assumes, of course, that the NEPA process is part of Federal decision-making. The purpose of NEPA is not the proliferation of paperwork, but the introduction of environmental values into decision-making. One aspect of this is the consideration of alternatives.

The words of NEPA very simply require the consideration of alternatives. The Department of the Interior, in a case involving off-shore drilling for oil was cited by the court (NRDC vs. Morton) for failing to consider alternatives in the broadest sense of the word. Any alternative that could be done within a time span, even if it was beyond the powers of the department, has to be considered. This ruling helps all the agencies that might possibly be affected by the decision and urges consideration of "alternatives" in a philosophical sense.

The reviewer must consider not only the alternatives posed but also the alternatives of taking no action. He should also consider the problem in its largest sense (e.g. highway construction is a problem of transportation and seen as such, alternatives might include other modes of transportation and not merely alternative corridors for the same mode.)

Some have suggested that having to consider alternatives in such a broad sense in connection with every project makes the decision-maker's job impossible. The answer to this and the one really intended by NEPA is that NEPA really requires impact review of programs from which projects flow. Once we, for example, review the impact of the interstate highway system as a whole, then EIS for individual highway projects can incorporate by reference much impact discussion. Two other aspects of NEPA's impact on decision-making require mention. First NEPA requires a systematic balancing of costs and benefits. It is not sufficient for the EIS physically to accompany the proposal through the agency review process; it must be considered in such process. Second, the EIS should present to the decision-maker, not a consensus view of environmental impact, but a whole range of views including any responsible minority ones. An understanding of these elements of the NEPA process is essential if the State is to provide meaningful comments on impact statements.

When we are all done, however, the question remains, is this all a lawyer's game? The strategist for a proposing agency can take one of three positions: he can claim that there will be no impact and leave it to the opponents, if any vocal ones are around, to point out the impact; he can admit impact but claim that it will only be temporary or minimal in an attempt superficially to "touch all the bases" without really grappling with the issues; or he can acknowledge the impact in full detail but outweigh it with the supposed benefits. All of these actions are dishonest to some degree but the dilemma really manifests itself in the last position which on face purports to apply the systematic balancing techniques required by NEPA. Secretary Morton's decision based on the final Trans-Alaska Pipeline (TAP) impact statement is an excellent example. He admits significant impact but says that the benefits to our national security are greater. Can we trust that the decision to accept adverse ecological impact was really made in behalf of the best public interest on balance? In weighing all the alternatives, did the decision-maker choose from an environmental point of view?

THE PLANNER AS CHANGE AGENT: A Multi-disciplinary, Citizen Participation Approach

Bradford Oswald

NEPA, a valuable planning tool, mandates team work when it requires a "systematic interdisciplinary approach." Federal guidelines require that specific procedures be built into State highway planning to include consideration for social, economic and environmental effect. These guidelines also state that planning must be done with the involvement of other agencies and the public early enough to influence both technical studies and the final decision. In New York State there are specific mandates for a collaborative approach including the two hearing processes, A-95 review, the requirement for official local advisory groups, and public access to the planning process. All of these have one purpose at heart: to provide for developmental rather than controlled two-way communication between the implementors and the receptors of public projects.

Very often the letter of the law is met through conventional procedures without the intention for teamwork being fully realized. It has been pointed out that this is the first time in history that planners are without a mechanism to meet the intent of the law in their practice, but I do not think that the problem is without solution.

Agencies have responded by stating that the performance gap is really a problem of lack of expertise, time and money. Often there is a crisis of resources and solutions because specialized field personnel are ill-equipped to handle the necessary load of organization and responsibility. I would suggest, however, that it is first a problem of methodology.

The use of different strategies for planning describes the problem of methodology facing us. A strategy has been defined as "a procedure, established in advance, which determines how, when, and to what depth various parties will participate in planning, evaluations, and decisions. It is not in any way, an attempt to deceive or to bypass or to circumvent legitimate interests."[1] Figures 1 and 2 show a strategy in which, essentially, communication is controlled. There are inherent obstacles to effective communication in these forms and this can be seen most clearly at a public hearing. Typically, after the ordeal, the engineers complain, "The public knows what it does not want but not what it wants," and citizens respond with, "You didn't let us know early enough to influence your plans." These emotional, defensive reactions are predictable. The controlling process in this type of situation guarantees a breakdown in communication.

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[1] Bishop et al, "Socio-Economic and Community Factors in Planning Urban Freeways," (FHWA, 9/70).

The teamwork approach is not inherent in Fig. 1 and 2, but in Figs. 3 and 4, true teamwork and developmental communication is possible. The coordinator and coordinator-catalyst strategies use an interdisciplinary approach. Interacting with agencies and the public to identify existing problems, these strategies utilize the full scope of our interaction objectives. (Fig. 5) Working effectively, the planning team would encourage appropriate interaction between the affected parties, coordinate interests, and resolve conflicts.

The gap between the letter and the intention of the law can be seen as the difference between these two strategies. A coordinating strategy, with strong environmental emphasis was used in our Elmira "in house" field planning effort.[2] In this case study, a process of management utilizing diverse agency and citizen talent secured our objectives as a location team to achieve substantial effective agreement on a course of action which is feasible, equitable and desirable. From May, 1971 to present local task teams (as in Fig. 4) interacted to study the problems inherent in the various courses of transportation action, including the existing course of no action, an expanded mini-bus system, alternative corridors, and TOPICS improvements. The formal communications the groups have established are: two background reports, one page working summaries of each for public reference, five community-located graphic displays, publicity handouts, a slide presentation, and multi-media discussions and reviews.

In this planning effort we utilized these major team management techniques:

1) "Total Project Coordination"--Communicate the project scope, roles, responsibilities, and timing; and get team participants from the planning through implementation stages.

2) "Tight Task Management"--Individually schedule assignments according to each participant's priorities and resources in a unified program. Delegate responsibilities so there are always several key operators functioning in the field.

3) "Involve All the Actors"--Engage all participants in a problem identification framework, as distinct from subsequent technical and policy-making decision-making.

4) "No Surprises"--Schedule and communicate incremental achievements in layman's terms to keep everyone up to date--no one is left out.

5) "Aim at Misconceptions"--Organize studies, technical work, and communications to overcome misconceptions as identified at each stage. Carefully separate factual informations from the conceptual.

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[2] North/South Arterial Concept Team, "Summary: Local Problem Identification (Stage 2), Elmira, N.Y.", New York State Department of Transportation. (May, 1972).

I think this management approach, when operating smoothly, is applicable to environmental problem solving and the preparation of EIS. I suggest a three step effort of identification, speculation, and preparation. First, major environmental problems must be identified. Information can be gathered through local and regional DEC personnel, interested conservationist groups, functional agencies and local sociologists. The objective is to include all local environmental perspectives. Second, speculation of the problems created by the project without remedial plan should be conducted at this step. Central Planning talent should be used at this point to check on the information input of Step 1 and to anticipate all cascading effects of the project. In particular, attention should be paid to those existing major problems that will be intensified by the project. The third step, the preparation of the EIS by the planner, would include those solutions of environmental problems detailed in the Remedial Plans and the Joint Development Plan. This process would require collaboration with the design, review, and supervisory personnel of the participating agencies. Therefore, throughout the planning process the planner acts as a change agent on a team, focusing issues, managing broad participation, and collaborating with DEC. The preparation of an EIS is only a component of planning's commitment to the "interdisciplinary systematic approach" and environmental emphasis that NEPA demands.

PLANNING STRATEGIES: THE APPROACHES TO PLANNING

FIGURE 1. Strategy of information

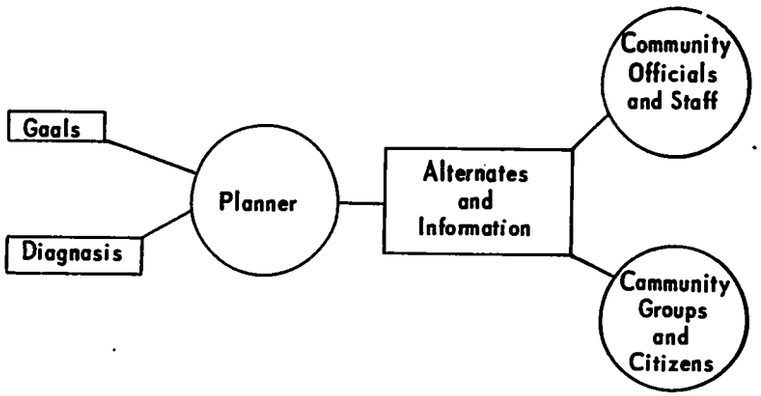


FIGURE 2. Information with feedback

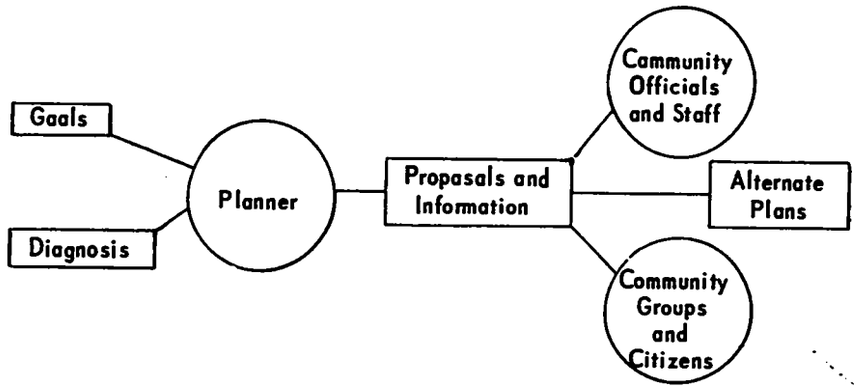


FIGURE 3. The coordinator

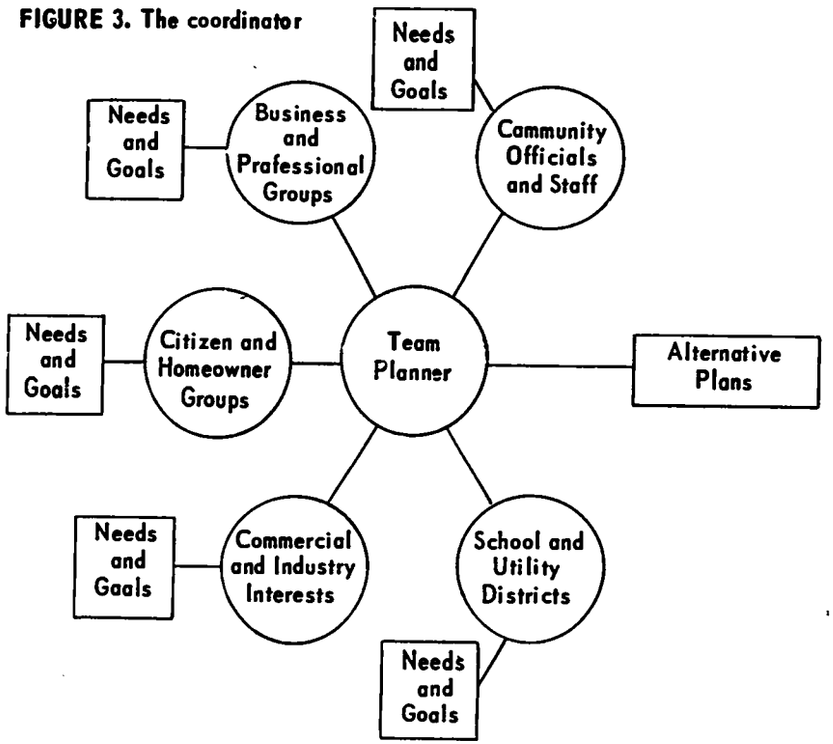
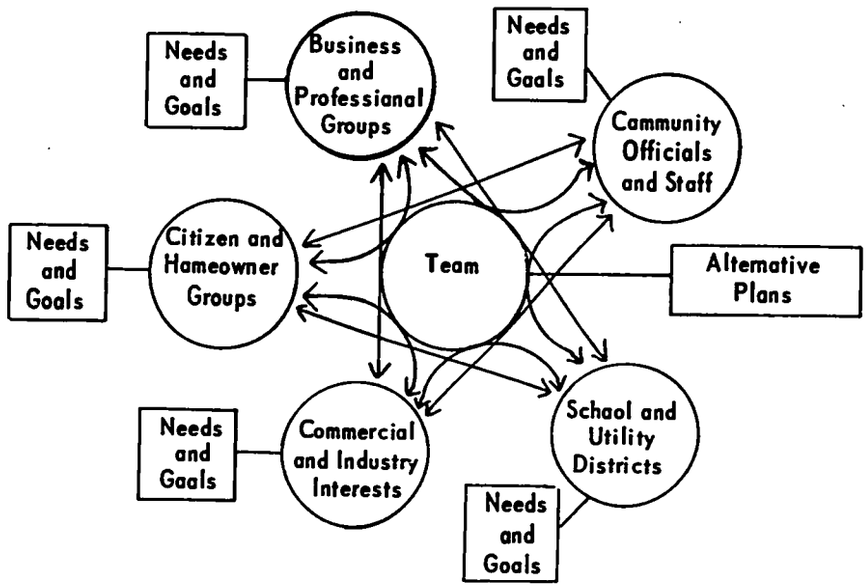
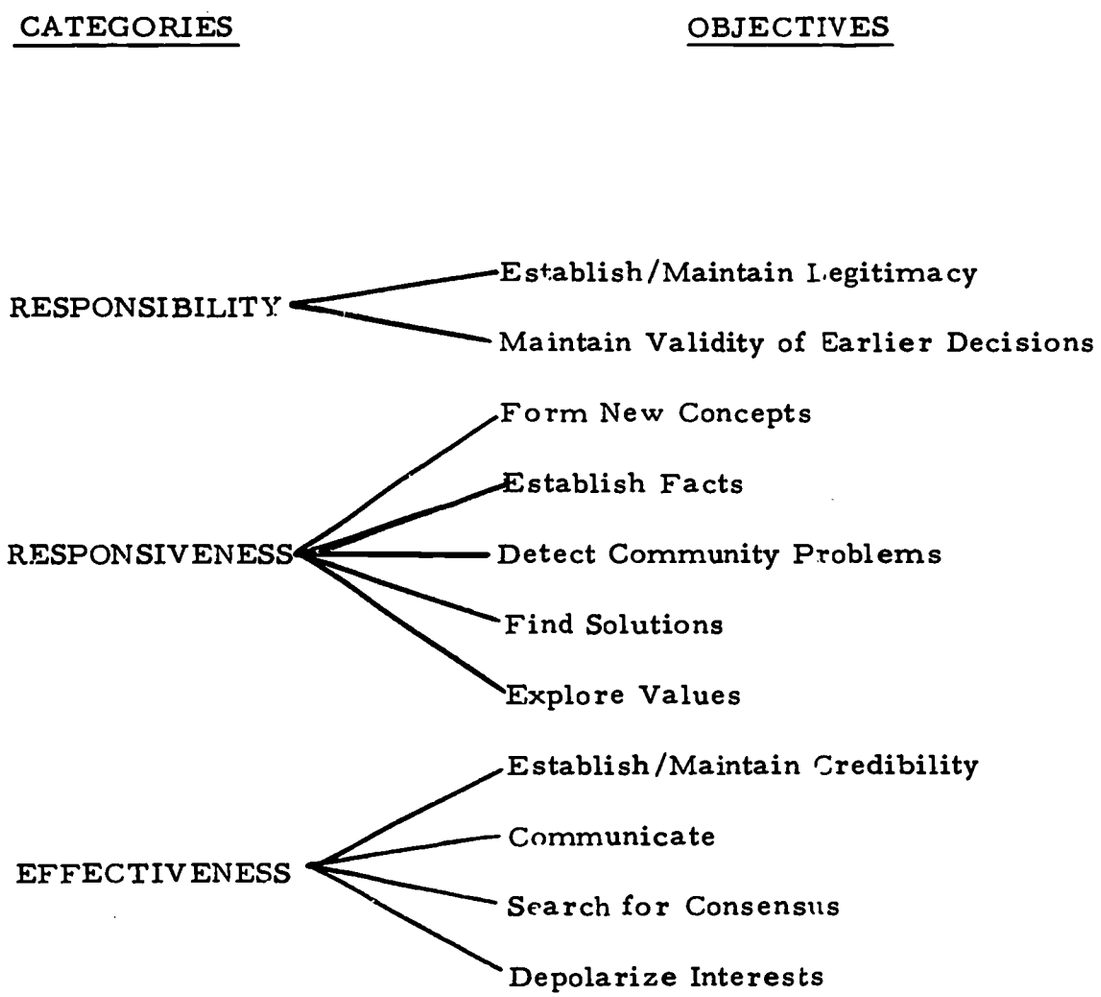


FIGURE 4. The caardinator-catalyst



INTERACTION OBJECTIVES



OPERATIONAL SKILLS:

The Information Matrix

During the group communication exercise the participants showed an eagerness to employ the task team process to environmental problem-solving. The presentations by core faculty members provided them with substantive knowledge needed to incorporate a systematic interdisciplinary framework for environmental analysis within the task team process. The teams were given two opportunities to combine their cognitive and associative skills into a "real world" problem solving effort. Their first exercise was the task team application of the US Geological Survey Information Matrix for Environmental Impact Assessment. After the concept had been explained to the assembly, the five task teams used the matrix to evaluate a draft EIS.

First the teams read the draft EIS entitled, "Maintenance of the Flushing Bay and Creek, New York Navigation Project."[6] Each team member then completed an individual matrix. These matrices were analyzed by the team and a team matrix was formulated. The assembly was reconvened and each team presented its matrix for evaluation. A summary matrix is presented in Appendix C.

Mr. Bruce Hanshaw, co-author of USGS Circular 645, the Information Matrix, and core faculty member, analyzed the team matrix results. He noted that the teams were in agreement on the major actions of the project and the elements of the existing environmental that would be impacted.

The Information Matrix, Hanshaw explained, also helped pinpoint faults in the sample Environmental Impact Statement. The EIS did not contain sufficient information on either the chemical composition of the dredge material or the duration of the dredging operation. Thus, the teams could identify the major elements of the ecosystem that would be affected by the action and point out faults in the same EIS through the use of the Information Matrix.

There are, however, some necessary clarifications of the results. In 2-1/2 hours, the separate groups reduced the original 88x100 matrix (8,800 possible interactions) to a 27x11 matrix (297 possible interactions). Of this last matrix, only 135 boxes were marked, representing the proposed actions, possible effects on the existing characteristics, and conditions of the environment. Also, the composite matrix as it appears in Appendix C contains only

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6 prepared by U. S. Army Engineer District, New York, New York, (January 17, 1972).

4 of the 5 team results and the magnitude / importance scalers have been eliminated for clarity.

The data on the composite matrix points out some weaknesses in this approach. The team members agreed unanimously that segments of the existing environment would be affected in 9 out of 25 cases. In like manner, unanimity over the proposed actions which may cause environmental impact occured in only 1 out of 11 cases. Although the lack of unanimity on the possible impact of the proposed action by DEC teams seems to indicate a weakness in this matrix format, there may be other factors involved. The time period for evaluation was short. Since the teams approached the matrix with different evaluational strategies, they concentrated in different areas and were unable to finish the entire matrix in the allotted time. The general agreement among the teams on major impact is, however, evident. There was a majority agreement or better on proposed actions which may cause environmental impact in 10 of 11 cases. Similarly, there was 50% or better agreement on the elements of the environment that may be impacted in 2/3 of the cases. The team members' general consensus on the areas of possible conflict due to the action indicates that the Information Matrix can be operationally effective.

Operational Skills: The Involvement Matrix

NEPA provided a far reaching mandate when it required utilization of a "systematic interdisciplinary approach which will ensure the integrated use of the natural and social sciences and the environmental design arts in planning and in decision-making which may have an impact on man's environment." Although the mandate was directed at Federal agencies it logically set the tone for all State and local governmental agencies.

All environmental agencies need a framework to conceptualize the implementation of this mandate. The framework must be flexible but thorough and one suggested for use in the DEC program was the Involvement Matrix. This presented the systems necessarily considered for sound environmental analysis, and the roles that environmental analysts and reviewers need to assume.

Involvement Matrix for Environmental Analysis

Systems

Roles:	Natural	Human
analyst		
change agent		

The four cells of the matrix dramatize and clarify the components needed for realization of the NEPA mandate. Systems can be divided along traditional academic disciplines into the Natural (e.g. biological, chemical, physical) and the social or Human (e.g. economic, sociological, political) legal sciences. NEPA requires two activities: planning and decision-making. In the Involvement Matrix they are translated into two distinct roles: analyst and change agent. The analyst collects, tests, and analyzes data, builds and tests models, gathers and presents factual information to the public and decision-makers. The change agent's role, involving both education and intervention, differs from that of the analyst. The change agent must take the factual information the analyst has provided and utilize it to influence decisions and/or effect social change.

Bennis (1966) characterized the change agent's role in terms of effectiveness, improvement, and development. Intervention and education within groups, agencies, and organizations help accomplish these objectives.

The Involvement Matrix assumes that NEPA requires consideration of its complete range of interaction between analysts, change agents, natural and human systems. One individual might function in all four activities or there might be a group of individuals functioning in any of the four. It seems apparent, however, that improved environmental decisions will result in instances where the entire matrix is employed. Each of the core faculty provided background and factual information on one or more of the activities in the matrix and, as a group, they covered all four of its components. It was also utilized by the participants in the analysis of a case study.

Case Study: Pioneer Valley Development Corporation

A case study illustrating the proposed development of a new community was created for the program. A copy of the memorandum used in the analysis is presented in Appendix D. The participants were asked to place themselves in a hypothetical situation of being advisors to the "Governor of Massachusetts." They were requested to advise the "Governor" on the environmental soundness of the developer's plans as outlined in the memorandum. Using some of the skills and information they had acquired during the program, they were asked to present their environmental review of the impact of this proposed land use change during a simulated briefing. In task teams, the participants analyzed the project plan, which had been presented in its most favorable light. Using the Involvement Matrix, they proceeded to evaluate the environmental impact of the proposed development.

Each task team presented its findings at the briefing and was quizzed by the assembly on its methods and results. Acting as analysts, the teams found that the description of the new community neglected environmental analysis of the impact on the existing quality of air and water, wildlife, State Forest land, and the Connecticut River. It was suggested that the

Information Matrix would be a helpful tool in this stage of analysis. The task teams saw problems in the human system in terms of economic, social, and political impact on the existing rural community. The groups offered some specific suggestions for functioning as change agents; these included review and enforcement of environmental law to ensure the protection of the area's natural resources and existing standards of environmental quality and consultation and communication with local groups to ascertain problems and to work collectively toward their solution.

Three consultants from The Department of Transportation, State Power Authority, and Urban Development Corporation provided the task teams with a glimpse of how their agencies would review the proposed new community. Transportation problems for providing access to the area were great enough to force The Department of Transportation to conclude that the expenditure for proper access roads would not be in the best interest of the people of Massachusetts. The Power Authority concluded that there would be potential problems in supplying power to the new community if the proposed new power facilities were not constructed. The representative of The Urban Development Corporation explained that the site was only marginally acceptable in terms of its ability to provide a viable economic and social structure for the anticipated population. This led into a discussion of whether or not the new community was needed at all. All agreed that transportation and power problems were seen as potential threats to the environment. The Pioneer Valley Development Corporation had presented a very sketchy environmental analysis and the viability of the new community had been questioned. However, the participants, as a group, did not see themselves as being able to effect a change in the plans to endorse the development. Because the case study had indicated that the Governor had endorsed the project, the participants assumed that the project would be developed and that their analysis of the hazards to both natural and human systems could only minimize but not prevent adverse effects. This view seemed to predicate all analysis and comment.

CONCLUSION

It is understandable that the participants had difficulty finding a way for DEC to utilize EIS review as a significant force in social decision-making. The course for correct and effective environmental impact review remains largely uncharted. It was The Institute's goal to provide the participants with at least the framework to develop a systematic, workable approach to environmental review. DEC, along with public agencies throughout the nation, has been mandated by law and public opinion to protect the environment from both public and private degradation. The exact nature of the mandate is cloudy; the methodology almost non-existent and charted more by accident than intent. In four days of intense activity, the participants gathered valuable tools for application to their own programs. The emphasis was balanced between content input and process involvement, but the communications effort, which was modelled in the formal communications sessions and applied throughout the task team process, struck at the very core of The Institute's concept for a systematic approach. It is, simply, that knowledge is only the first step toward effectiveness. Expert advice is necessary and beneficial, but it is imperative for individuals to utilize their skills in a team process and work collectively for the establishment of a systematic process for environmental analysis and review.

The belief that Learning is Doing characterized The Institute's approach. The factual information presented by the core faculty was intended for both comprehension and application, as modelled in the task team exercises. Most significantly, the participants worked toward translating their responses to the communications process and input from the core faculty into positive attitudes for constructive change within DEC. It is hoped that the interaction process begun at The Institute will continue. Work toward the development of a viable system of environmental review within DEC was begun during the program. It will continue to evolve into a comprehensive, viable system that will effectively serve the people of New York State.

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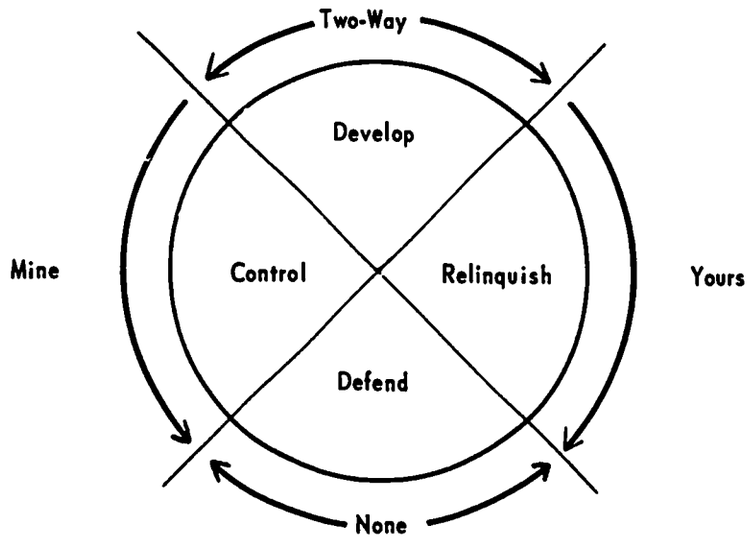
APPENDIXES

APPENDIX A

COMMUNICATIONS MODEL

SUMMARY



The circle is divided into four quadrants, indicating the four approaches to another person:

QUADRANT	APPROACH
Control	"I want to have most of the influence."
Relinquish	"I want to give you influence."
Develop	"I want to use my influence and yours to solve a problem."
Defend	"I want to stay uninvolved and neither exert nor respond to influence."

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THE DEVELOPMENTAL COMMUNICATOR

--Encourages two-way communication.
--Strives for joint understanding of problems and goals.
--Willing to contribute ideas, suggestions.
--Doesn't assume he's right.
--Encourages exploration and experimentation.

THE CONTROLLING COMMUNICATOR

--Relies heavily on one-way communication.
--Assumes that his own ideas and approaches are best.
--Tries to impose or sell his own point of view.
--Does not like to consider alternatives.
--Is not interested in experimentation.

THE RELINQUISHING COMMUNICATOR

--Shifts the burden to the other fellow.
--Assumes the other fellow has more to contribute than he does.
--Makes few contributions of his own ideas.
--Willing to consider alternatives but doesn't probe to develop them.
--Willing to let others experiment.
--Explores only to fit in with the other fellow's viewpoint.

THE WITHDRAWN COMMUNICATOR

--Avoids interaction.
--Assumes "nothing can be done."
--Neither contributes nor solicits contributions.
--Not interested in new approaches.
--Not interested in experimentation.

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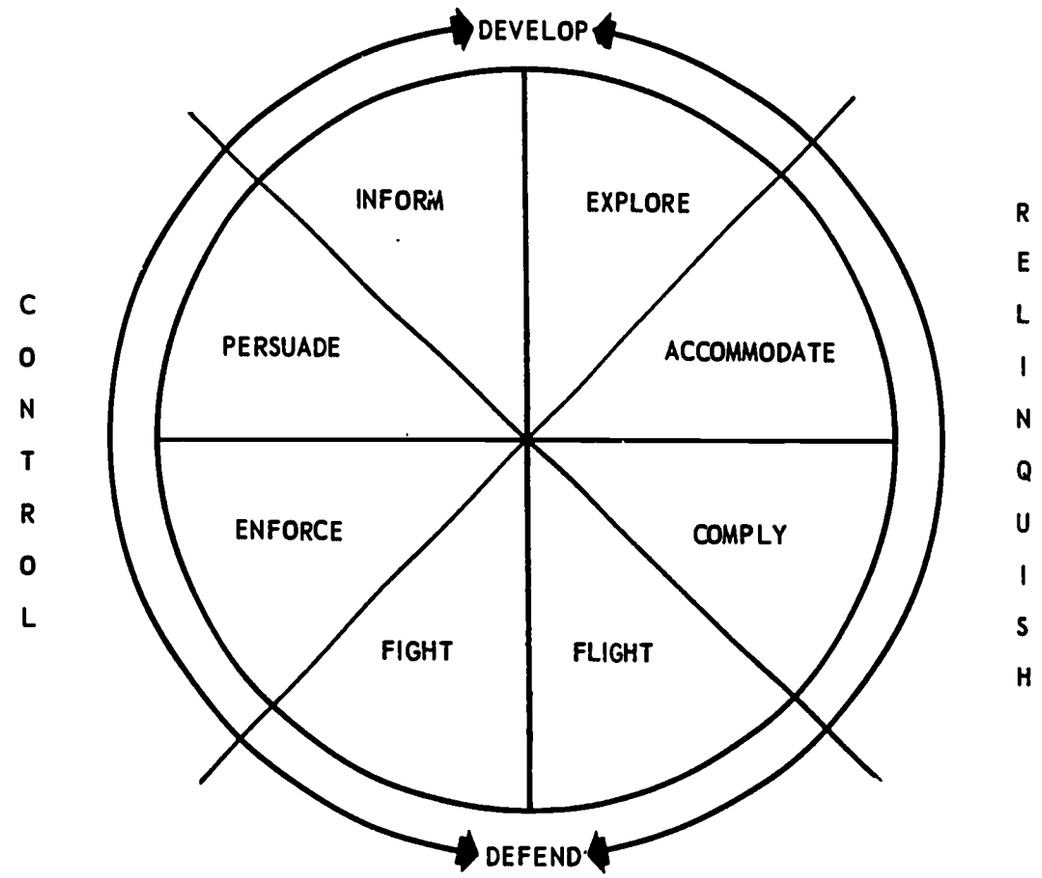

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CONDITIONS CHECKLIST

CONTROLLING :

1. The boss has all or at least most of the facts, experience or knowledge related to the problem at hand.
2. He has control of alternatives.
3. Joint commitment is not important.
4. Speed is important (or there is an emergency).

RELINQUISHING :

1. The other person has most of the facts and experience related to the problem.
2. The problem is highly personal and not work related.
3. The other person is highly motivated.
4. The other individual is highly emotional or disturbed by the problem at hand.

DEVELOPMENTAL :

1. The individuals involved do not have all of the facts, experience and knowledge involved.
2. Joint commitment is important.
3. There may be resistance or difference of opinion between the people concerned.
4. There's a need or an opportunity for creativeness or innovation - new ideas are needed.

DEFENSIVE :

1. When there is a legal, moral, or ethical issue.
2. When the individual is frustrated or does not understand the situation in which he is involved.

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APPENDIX B

FORCE FIELD ANALYSIS

The New York State Department of Environmental Conservation recently conducted a study of the major factors affecting developmental communications within DEC. Individual teams were asked to identify the components of two factors affecting communication; driving factors which promoted interchange and restraining factors which inhibited communication. The major conclusions of the 4 teams are included in the tables below.

DRIVING FORCES

AREA	BLUE	GREEN	BROWN	RED
1. Interdisciplinary Approach		X	X	
2. Dept. Esprit de Corps		X	X	X
3. Dept. is suitable environment, develops dedication	X	X	X	X
4. Public support and concern	X		X	X
5. Need for environmental information	X			X
6. Dept has been responsible following legislative mandate	X	X		
7. Mature and organized with quality results	X	X	X	

RESTRAINING FORCES

AREA	BLUE	GREEN	BROWN	RED
1. Personal value conflicts and egos		X	X	X
2. Outside public pressure	X	X	X	
3. Lack of confidence		X	X	X
4. Resistance to change	X	X		
5. Avoiding responsibility and uneven work distribution		X		X
6. Too much compartmentalization, fragmentation through diversity	X		X	
7. Lack of systematic approach in diverse situations	X		X	

In addition, some of the Department of Environmental Conservation teams indicated mechanisms to alleviate the restraining forces. The blue team centered on the lack of a systematic approach in solving environmental adversities. Blue suggested that individuals in the Department involve themselves in making proposals, become more receptive to other ideas, take advantage of training progarms and make sure the individual and his co-workers are aware of all departmental projects. Blue suggests that the Department explicitly clarify goals and policies and disseminate them through all available channels. The green team discussed ways of clarifying objectives. They proposed that the unit head draft up initial objectives, then a conference would arrive at a con-

sensus decision on program objectives. The brown team cited responsibility, fields of expertise to be identified and possible use of outside consultants. Finall, the red team offered suggestions on improving departmental communications. They proposed more opportunities to meet key personnel, formation of study groups to make specific recommendations and greater use of existing facilities (like the newsletter). The Department teams were concerned in helping the Department of Environmental Conservation become more effective. Their belief that they can effect a change for the better is exemplified in the strong Department driving forces.

APPENDIX C

The following is a composite Information Matrix for Environmental Impact Assessment compiled from the individual DEC team matrices. This composite represents 4 of the 5 team matrices; the remaining matrix was not available for tabulation. The format is a condensed version (27 x 11) of the original matrix, (88 x 100) showing only the cells that were marked by the individual teams. The outline code, i.e. IB2c, is included for reference to the original Information Matrix. The "No. of groups marking this category" legend refers to the total number of groups (out of a maximum of 4) who marked a cell somewhere in the category. The number appearing in each cell is that number of teams marking the particular cell. A dash (-) indicates that no team checked the cell.

No. of groups marking this category			3	2	3	3	1	3	2	2	2	4	3
COMPOSITE MATRIX of 4 DEC TEAMS I	No. of groups marking this category	II	II Ac Modification of Habitat	II Ag River control & flow modification	II Am Noise & Virbration	II Bj Channel dredging & straightening	II Ce Dedging	II Ee Harbor dredging	II Gd Shipping	II Gf River & Canal traffic	II Gg Pleasure boating	II Ha Ocean dumping	II Jb Spills & leaks
I A1b Construction Material	1		-	-	-	-	-	-	-	-	-	1	-
I A2a	1		-	-	-	-	-	-	-	-	-	-	1
I A2b Ocean	4		3	1	-	1	1	1	1	1	1	3	1
I A3a Quality (Atm)	3		1	-	-	-	-	-	1	1	1	-	-
I A4c Deposition	4		1	2	-	2	1	3	-	-	-	4	-
I A4f Compaction & Settling	1		1	-	-	-	-	-	-	-	-	-	-
I B1e Microflora	4		3	1	-	3	1	3	-	-	-	3	1
I B1f Aquatic Plants	2		1	-	-	-	-	1	-	-	-	1	-
I B2a Birds	4		1	-	3	1	-	1	-	1	1	-	1
I B2c Fish & Shellfish	4		2	1	1	3	1	3	-	-	-	4	2
I B2d Benthic organisms	4		2	1	-	3	1	2	-	-	-	4	2
I B2e Insects	1		-	-	-	-	-	-	-	-	-	-	1
I B2f Microfauna	3		2	1	-	3	1	2	-	-	-	3	1
I B2g Endangered species	1		1	1	1	1	1	1	-	-	-	-	1
I C1f Residential	1		-	-	1	1	1	1	-	1	-	-	-
I C1g Commercial	2		-	-	1	2	1	1	1	1	-	-	-
I C1h Industrial	2		-	-	-	2	1	1	-	1	-	-	-
I C2b Fishing	2		2	1	2	2	1	2	-	1	1	2	1
I C2c Boating	4		-	-	1	3	1	2	-	2	-	-	1
I C4b Health & Safety	1		-	-	1	-	-	-	-	-	-	-	1
I C4c Employment	3		-	-	-	1	-	1	1	-	-	1	-
I C5a Structures	1		-	-	-	1	-	-	-	-	-	-	-
I C5b Transportation Network	3		-	-	-	2	-	1	1	-	-	-	-
I C5d Waste Disposal	1		-	-	-	1	-	1	-	-	-	-	-
I Dd Food chain	4		3	1	-	3	1	3	1	1	1	1	1
I a Bird watching	2		-	-	1	1	-	-	-	1	-	-	-
I A2d Quality (H_2O)	4		2	1	-	3	1	3	2	1	2	4	3

APPENDIX D

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF NATURAL RESOURCES

MEMORANDUM

TO: Frederick Forest, Director, Office of Environmental Analysis
FROM: Commissioner Clearwater
Subject: New Community on Connecticut River near Northfield
Date: May 24, 1972

Governor Private has asked me for a briefing on the key environmental factors relevant to the proposed development of a new community on the Connecticut River in the town of Northfield, Franklin County. In a press release last week, the Governor endorsed the project, calling it an excellent example of "progressive planning."

The enclosed project description was taken from the proposal written by the Pioneer Valley Development Corporation and naturally tends to place the development in a favorable light. However, it is obvious that there will be major environmental effects if development takes place.

I would like you and your staff to meet with me tomorrow morning at 11:00a.m. in my office to discuss the probable environmental consequences of the proposed development. I am particularly interested in determining the factors that should be included in a Draft Environmental Statement and in the methods of evaluating those factors.

Pioneer Valley New Community

Location: North Central Massachusetts, extending from East Bank of Connecticut River to Erving State Forest. Nine Miles N.E. of Greenfield, Mass.(pop. 12,070); Six miles South of New Hampshire State line.

Purpose: The Pioneer Valley Development Corporation has proposed a new concept in community development through the use of Total Community Planning. PVDC has concentrated on full utilization of the natural environment and enhancement of recreational potentials and service facilities while providing needed employment and residential opportunity within one unified area. The Pioneer Valley Development will have over 50 percent of its acerage in open space and natural recreation areas, which PVDC says is a larger percentage than any previous planned community in the Northeast. It will be the first "new town" to utilize a site with a variety of hills and valleys among its surface features. Detached residential structures will be in small clusters of 50 to 70 units which will be generally hidden from each other by the natural topography. At the same time PVNC will be almost self-sufficient economically. Nearly 70 percent of the residential labor force will be employed in the planned industrial park within two miles of their home. The remainder of the residents in the labor force are expected to commute to

Amherst, Greenfield or Brattleboro. It is also anticipated that ten to twenty percent of the single family units will be used essentially as second homes, with the owners not in the local labor force.

PVNC will also provide employment and low-income housing for current area residents. This will alleviate the problems of high unemployment and deteriorating housing facilities in a region of declining agricultural viability. It is expected that 1,200 low-income apartments will house 4,000 people and that 1,500 unskilled and semi-skilled jobs will be created.

Project Description: PVNC will be a 6,000 acre area containing 6,8000 residential units (3,600 single family and 3,200 multi-unit, low and middle income). Expected population will be 22,440, including seasonal residents. The community will contain a 625 acre industrial park zoned for light industry, with anticipated capacity of 5,000-6,000 employees. Additional area employment opportunities exist at nearby education centers including Amherst, Smith, and Mt. Holyoke Colleges, Deerfield Academy and the University of Mass. The Commercial Transportation connection to the Springfield SMSA via Interstate 91 is excellent. The 43 mile trip can be made in less than an hour. The Central Vermont and Boston and Maine Railroads are also adjacent to the development area. A 345 KV transmission line cutting through the Western section of the development has been proposed by the Northeast Power Coordinating Council. The line would emanate from the Vermont Yankee Nuclear Power Station and connect with a proposed pumped storage plant at Northfield. From Northfield the line would follow South through PVNC to a substation outside of Springfield. According to the Council the 700MW facility of Northfield will be necessary to provide power needs of PVNC before 1985.

Site Area: PVNC is located in the Town of Northfield,(pop. 2,580) in Franklin County, Mass. The community will be situated in a valley area with the elevation increasing from the Connecticut River eastward to the Erving State Forest. In the Southeast section of the Community is a large hill known as Crag Mountain where a recreation development with a 175 acre lake and a small ski area is to be constructed. Wholly or partially within the site area there are currently eleven operating farms, predominantly in the Western section of the development near the Connecticut River. The principal crops are dairy products,poultry products, apple, and peaches. There are two fairly large farms,(175 acres) producing shade cigar wrapper tobacco and one farm in the eastern woodlands which produces maple syrup. The land is considered marginal for farming purposes, with only the tobacco farms considered to be viable in the long run. The flood plain adjacent to the river will be developed as a recreation area open to the public. Facilities will include boat launching site, marina, bath house and picnic facilities.

Community Design:

Residential - 2,800 single family detached houses on 1/4 acre lots - 1, 100 acres
800 single family attached houses - 150 acres
3,200 apartments - 4 to 6 stories - 350 acres

Commercial Community Facilities - 350 acres

Recreation Area	- Developed Acres	600 acres	
	- Undeveloped Acres in Snag Mt. Area		2,100 acres
Open Space			300 acres
Industrial Development			625 acres
Land Reserves			475 acres
		Total	6,000 acres

Transportation Access:

Existing Highways

Five miles west of the PVNC is I 91 which runs North-South paralleling the Connecticut River and will be the prime commercial transportation route. Massachusetts Rt. 2 joins I 91 at Greenfield and provides an East-West link two miles South of the New Community. A secondary North-South highway (Mass. Rt. 63) goes through the development and directly South to Amherst. Finally, Mass. Rt. 10 passes through Northfield just North of PVNC, crosses the Connecticut River and joins I 91 four miles West of the development at Bernardston. During construction the developer will use Rt. 63 as the principal access road to the site. A variety of existing town roads and unpaved farm roads will be utilized for movement of construction equipment and material to the various interior housing clusters. In addition, some forest trails will be cleared and widened.

Needed Access

I. At present there are three proposed corridors to provide direct access between I 91 and PVNC.
   A. Existing interchange of Rts. 2 and 91; new access road from Rt. 2 East of Greenfield to PVNC.
   B. Existing interchange of Rts. 10 and 91; Rt. 10 widened to Mt. Hermon; new access road from Rt. 10 to PVNC.
   C. New Interchange on I 91 North of Greenfield, new access road to PVNC.

   All three of these corridors cross the Connecticut River and intersect Rt. 63 in the development area.

II. An interchange at the junction of Rt.63 and the proposed access road to I 91.

III. An interchange at the junction of Rt. 63 and Rt. 2.

IV. Widening of Rt. 63 along present corridor from Northfield South to Amherst.

APPENDIX E
Monday, May 22, 1972 Through
Thursday, May 25, 1972

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION: RESIDENT PROGRAM

"A Systematic Approach to Environmental Impact Review"

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