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Volume I

by

Thomas Neil Gladwin

A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
(Business Administration)
in The University of Michigan
1975

Doctoral Committee:

Professor Vern Terpstra, Chairman
Professor Robert W. Adams
Assistant Professor Richard N. L. Andrews
Associate Professor Raymond E. Hill
Faculty Member Arie de Koning, Centre d'Etudes Industrielles, Geneva, Switzerland

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CHAPTER I

INTRODUCTION

> "Man is part of a natural system, the Earth, and is ultimately subject to the limits of the system."
>
> --Population Curriculum Study, The University of Delaware[1]

A. THE GLOBAL ENVIRONMENTAL PROBLEM

Disruption of the environment has come to be recognized as one of the most serious and pervasive problems ever faced by mankind.[2] Brubaker has ranked our environmental problems in the following ascending order of gravity: loss of amenity, threats to human health, threats to human genetics and reproduction, and damaging effects on ecological systems and the earth's life supportive capacity.[3] All of these relate to the fact that mankind is diminishing the capacity of the environment to perform its indispensable functional,[4] tangible,[5] and intangible[6] services, upon which the quality and survival of human life ultimately depend.[7]

The root cause of the environmental crisis was stated by Aristotle more than 2,000 years ago: "For that which is common to the greatest number has the least care

bestowed upon it."[8] The absence of well-defined property rights or satisfactory collective institutions for the management of common property resources (air, most watercourses, the sea, aesthetic qualities of the landscape, and so on) has led to oversue, abuse, congestion, and degradation of these resources, or as Hardin has written: "The Tragedy of the Commons."[9]

In more specific terms, environmental degradation can be viewed as a multiplicative product of interconnected causes including economic growth, population growth, population concentration, per-capita income levels, consumption patterns, and technology.[10] Pollution (i.e., reduction in environmental quality caused by the generation and disposal of residuals) is the central environmental problem addressed in this research; multiple sources of it can be identified. Air, water, and noise pollutants, as well as solid wastes, are all emitted from a wide range of productive and consumptive activities including industry, agriculture, navigation, transportation, municipal and domestic waste disposal, and so forth.

Institutional frameworks for environmental management are evolving rapidly throughout the world. Many governmental units are attempting to bring their common property resources into some system of governance. Environmental degradation is being viewed as a case of "market failure," which justifies the intervention of collective

or public management. In this view, pollution is largely the result of negative externalities, which imply divergences between private net product and social net product.[11] In the presence of externalities, private outputs are not consistent with the maximization of social welfare, and resources are therefore inefficiently allocated.[12] Corrective actions and remedial policies are justified in order to internalize the costs to the extent possible, i.e., to make producers bear the "true social costs" of their production.

Although environmental problems transcend political boundaries and stages of economic development, it is true that the character and severity of the problems facing any particular nation or region vary considerably. This is so because topographical and climatological conditions, densities of settlement, degrees of industrialization, modes of transportation, energy consumption patterns, and levels of environmental assimilative capacities differ markedly. The social objectives and priorities which are accorded to environmental protection also vary internationally. The relative weight given to the issue differs widely among political collectives, reflecting existing stages of economic development, income distributions, social and cultural values, political support, levels of ecological awareness, existence of pressure groups, and so on.[13] This diversity implies that the substance, intensity and

timing of governmental programs, policies and standards will differ substantially among nations.

Despite this diversity, the fact remains that mankind had "only one earth,"[14] with finite resources and a unitary life support system which increasingly is being overtaxed. The essence of the problem has been stated by Kapp:

> Human action . . . takes place within, and has repercussions on, our natural-physical environment which has its own ecological structure and is subject to specific laws. If these structures and regularities are left out of account, either due to ignorance or deliberately, the outcome of any decision may differ from one's intended objective . . . even if the original goal is attained, there may be additional effects of a negative character.[15]

Kapp and many others believe that we can no longer blindly change the world about us while ignoring the consequences of change, without threatening our own survival as a species. An ecological dimension urgently needs to be added to the management of man's activities.[16]

B. THE ROLE OF MULTINATIONAL CORPORATIONS IN THE GLOBAL ENVIRONMENTAL PROBLEM

Excluding centrally planned economies, multinational corporations (MNCs)[17] are estimated to contribute roughly one-fifth of world G.N.P.[18] Output of MNCs has been expanding at a rate of about 10% per year in real terms, while gross world product has been expanding at only about 5% a year.[19] Some observers speculate that before the close of

the century some 300 of the largest MNCs will produce more than one-half of the world's goods and services.[20] Even though simplistic extrapolations of this type lack credibility,[21] one current conclusion is inescapable--the industrial operations of the world's MNCs necessarily have a substantial influence on the quality of the global environment. They are found in some of the most pollution-intensive industries, and are responsible for much of the world's generation of residuals. Their behavior will be a crucial factor in years to come in determining whether world environmental quality is enhanced or degraded.

MNCs are currently faced with a pervasive, yet varied, global social movement aimed at reducing the incidence of environmental disruption generated by their activities. Publics are increasingly demanding that MNCs take into account (i.e., internalize) the social costs of an important category of resources which they consume--namely, those environmental resources such as air and water which are owned in common by the community, and for which no payments have heretofore been required. Hundreds of conflicts between MNCs and environmentally concerned publics in many nations have occurred in recent years. These conflicts have resulted in unfavorable press reports, law suits, countless delayed or terminated projects, forced closings and major plant conversions.[22]

The economic costs to MNCs for insufficiently taking ecological considerations into account, or for not being sensitive enough to public values concerning the use of environmental resources, have thus been high. The future profits, growth and security of MNCs will depend in part on how successfully they can learn to harmonize their activities with environmental systems. Projects will increasingly have to be planned, evaluated, designed, constructed, and operated in such a way as to ensure that all potential environmental consequences and remedial measures are identified.

C. FOCUS OF THE RESEARCH

At a high level of abstraction this study is concerned with the question of how continued economic growth is to be reconciled with the necessities of environmental protection. How can industrial development proceed in ways minimally disruptive to the environment? How can industrial development proceed in ways such that costly project delays, terminations, closings, conversions, and so forth can be avoided? The answer to all of these questions is possibly the same--through environmentally-sound project planning involving prior assessment and selection of project actions with a view toward avoiding or minimizing adverse environmental consequences before they occur.

Broadly viewed, the focus of this research is on environmentally-oriented project planning. More specifically, it is on the role which ecological considerations currently play in the project planning processes of MNCs in three industries (petroleum, chemicals, and metals) which traditionally have been pollution-prone in character. Two questions relating to the incorporation of ecological factors into project planning by MNCs are addressed in the study: 1) to what extent and why? and 2) in what manner and why? The focus is thus on the inputs and means going into the planning process, rather than on the ends or outputs of the process, on which environmental quality ultimately depends. The reasons for this focus are discussed in the next chapter, but it is important to note here than an assumption has been made that a strong positive relationship exists between environmentally-sound project planning and environmentally-sound project outputs.[23]

D. OUTLINE OF THE RESEARCH

1. Chapter II--Literature Review and Conceptual Framework of the Study

The guiding conceptual framework of the study is developed, and the relevant literature and past research are reviewed in this chapter. One part of the framework consists of an operationalized construct entitled "ecological incorporation" which pertains to the effective integration of ecological considerations into the succession of

activities involved in project planning. This was created for the purpose of describing and measuring current planning behavior and was derived from the existing literature on investment project planning and environmental impact assessment. The second part of the framework consists of a contextual model of explanation which views ecological incorporation as a product of three interlocking influence systems: project nature, organization, and public policy. This model was developed from the literature on organizational innovation and organization-milieu relations.

2. Chapter III--Research Design of the Study

This chapter outlines the research design employed in the study, which could be described as cross-sectional, cross-national, comparative, exploratory, small sample, and interview-based. The design is described in four parts: data acquisition, data measurement, data analysis and interpretation, and limitations of the research design.

3. Chapter IV--The Role of Ecological Considerations in Multinational Corporate Project Planning

The findings on the extent to which, and manner in which, ecological considerations have been integrated into the project planning processes of a sample of MNCs are presented in this chapter. The findings are first qualitatively described using a question and answer format. They

are then transformed by means of categorization and scoring operations into quantitative indices in order to attain a ranking of planning processes from least to most on the contruct of ecological incorporation.

4. Chapter V--The Influence of Project Nature

This chapter examines the relationships between environmentally-oriented project planning behavior and the nature of the project being planned. The influence of five variables are examined: project type, project cost, project year, site location type, and project ownership.

5. Chapter VI--The Influence of Organization

The focus of this chapter is on relationships between environmentally-oriented project planning behavior and organizational characteristics of the firm doing the planning. Five variables related to the firm's "environmental management structure" are examined: objectives and top management commitment, role assignment, performance measurement, research and technology programs, and external surveillance and interaction. The influence of three variables related to the firm's economic character are also explored: profitability, size, and investment intensiveness.

6. Chapter VII--The Influence of Public Policy

The relationships between environmentally-oriented project planning behavior and the public environmental

policy systems in which the firms were operating are examined here. An examination is made of the influence of three "host" country policy variables: environmental policy character, project-associated public pressures, and public project examination. "Home" country influence is explored by means of two variables: environmental policy character and environmental conflict experience.

7. Chapter VIII--Conclusions on the Determinants of Ecological Incorporation: A Tentative Model

This chapter summarizes, interprets, and draws conclusions from the findings presented in Chapters IV through VII. These conclusions are presented in the framework of two questions relating to ecological incorporation: 1) to what extent and why? and 2) in what manner and why?

8. Chapter IX--Policy Implications and Suggestions for Future Research

This chapter draws out the implications which emerge from the findings and conclusions of the study. An environmentally-oriented approach to project planning is outlined for MNCs; ideas on a system of regulation to guide the planning behavior of MNCs is offered for public policy makers; and new priorities and strategies for future research, at both the descriptive and normative level, are set forth for researchers.

E. VALUE OF THE RESEARCH

The potential value of this research is best expressed by emphasizing the need for such research. Anshen and Guth have expressed it in this fashion:

> In an era when questions are increasingly raised about the adequacy of the institutional framework of our society to cope with problems of social justice and enhancement of the general quality of life, it seems to us appropriate that those in the field of policy formulation and implementation study present and prospective relationships among these problems, the private business firm, and other institutions of our society. At the descriptive level, more needs to be known about present approaches to and problems of managers in relating their firms to social problems and to governmental and semiprivate institutions. At the normative level, alternative conceptions of the role of the private business firm in relation to these problems, and in relation to other institutions need to be formulated and systematically explored.[24]

In a descriptive intellectual sense, the research should be of value in three ways. First, our knowledge of how MNCs have organized for environmental management and how they have or have not integrated environmental concerns into their planning processes has been increased. Second, the research has created and operationally defined the construct of "ecological incorporation." This concept, through further revision and adaptation will be able to be applied in the study of other decision-making situations, for example in the field of new product development. Third, useful knowledge has been gained which should prove useful in advancing the theory of organizational adaptation or

innovation in response to external change. This knowledge mainly centers on the response patterns of MNCs with respect to internationally heterogeneous social demands.

The research should also be of some practical value. The study represents normatively oriented research in that an attempt was made to improve our understanding of the system of forces which motivate, facilitate, or inhibit the adoption of the innovation of environmentally-oriented planning procedures. The research has tentatively identified a series of leverage mechanisms, both within the firm for use by top management and outside the firm for use by public policy makers, which can be adjusted in order to bring about an environmentally-oriented mode of corporate planning.

FOOTNOTES

CHAPTER I

[1]Robert W. Stegner and Val E. Arnsdorf (codirectors), A Conceptual Scheme for Population-Environment Studies, experimental edition revised, (Newark: Population Curriculum Study, University of Delaware, 1973), p. 7.

[2]See: Paul R. Ehrlich, Anne H. Ehrlich, and John P. Holdren, Human Ecology: Problems and Solutions (San Francisco: W. H. Freeman, 1973); Clifford S. Russell and Hans H. Landsberg, "International Environmental Problems: A Taxonomy," Science, 172 (June 25, 1971), pp. 1307-1314; and Barbara Ward and René Dubos, Only One Earth: The Care and Maintenance of a Small Planet (New York: W. W. Norton, 1972).

[3]Sterling Brubaker, To Live on Earth: Man and His Environment in Perspective (Baltimore, Md.: Johns Hopkins Press, 1972), Chapter 3.

[4]Such as nutrient cycling, climate regulation, pest control, and the removal, dispersion, storage and degradation of waste or residuals.

[5]Such as flows of water or minerals.

[6]Such as scenic views.

[7]Economists view the environment as a kind of natural asset or nonreproducible capital good that produces a stream of valuable services for man. See: A. Myrick Freeman, III, Robert H. Haveman, and Allen V. Kneese, The Economics of Environmental Policy (New York: John Wiley, 1973), pp. 18-22.

[8]Aristotle, Politics, Book II, Chapter 3.

[9]Garett Hardin, "The Tragedy of the Commons," Science, 162 (Dec. 13, 1968), pp. 1243-1248.

[10]Various observers emphasize different factors as being the most important cause. For technology see: Barry Commoner, The Closing Circle: Nature, Man, and Technology (New York: Alfred A. Knopf, 1971); for population growth see: Paul R. Ehrlich and Anne H. Ehrlich, Population, Resources, and Environment: Issues in Human Ecology (San Francisco: W. H. Freeman, 1971); for economic growth see:

E. J. Mishan, Technology and Growth, The Price We Pay (New York: Frederick A. Praeger, 1970).

[11]The literature on externalities is extensive. For a good collection of readings see: Robert Staaf and Francis Tannian, eds., Externalities: Theoretical Dimensions of Political Economy (New York: Dunellen, 1973).

[12]For resource allocation effects see: Ronald Coase, "The Problem of Social Cost," Journal of Law and Economics, 3 (Oct., 1960), pp. 1-44; E. J. Mishan, "The Postwar Literature on Externalities: An Interpretive Essay," Journal of Economic Literature, 9 (March, 1971), pp. 1-28; and James R. Marchand and Keith P. Russell, "Externalities, Liability, Separability and Resource Allocation," The American Economic Review, 63 (Sept., 1973), pp. 611-620.

[13]See Appendix D, Figure 1 for a full listing of the factors relevant in the determination of national environmental policy.

[14]"Only One Earth" was the central theme of the United Nations Conference on the Human Environment held in Stockholm during June 1972.

[15]K. William Kapp, "Environmental Disruption: General Issues and Methodological Problems," in Shigeto Tsuru, ed., Proceedings of International Symposium on Environmental Disruption (Tokyo: The International Social Science Council, 1970), p. 7.

[16]See: Maurice F. Strong, "One Year After Stockholm: An Ecological Approach to Management," Foreign Affairs, 51 (July, 1973), pp. 690-707.

[17]A MNC is defined in managerial terms as a firm which has substantial international operations, which operates facilities in a number of countries, which exercises managerial control over assets abroad, and which attempts, at least in part, to follow a central optimizing strategy across national boundaries. This conception clearly applies to such firms as EXXON, Royal Dutch Shell, British Petroleum, Dow Chemical, BASF, Imperial Chemical Industries, Alcan Aluminium, Rio Tinto-Zinc, and Pechiney.

[18]United Nations Department of Economic and Social Affairs, Multinational Corporations in World Development, ST/ECA/190 (New York: United Nations, 1973), p. 13.

[19]The Diebold Institute, Business and Developing Countries: A Study of the Role of Private Enterprise in Economic Development (New York: Praeger, 1973), p. 5.

[20]Richard Eells, "Do Multinational Corporations Stand Guilty as Charged?" Business and Society Review, No. 11 (Autumn, 1974), p. 82.

[21]See: Stephen Hymer, "Is the Multinational Corporation Doomed?" Innovation, No. 28 (Feb., 1972), pp. 10-17, and Norman Macrae, "The Future of International Business," The Economist, (Jan. 22, 1972), pp. xxi-xxii.

[22]See Appendix D for a list of fifty such well-known environmental conflict episodes.

[23]The validity of this assumption might be subject to question. Richard N. L. Andrews has discovered in many cases that the extent to which environmental data is generated in U.S. federal agency planning is proportional to the likelihood of public or judicial controversy, not to the soundness of the project output per se. In other words, environmental data are generated defensively, rather than as an important element in the decision process. See: Richard N. L. Andrews, "Environmental Policy and Administrative Change: The National Environmental Policy Act of 1969, 1970-1971," (unpublished Ph.D. dissertation University of North Carolina, Chapel Hill, 1972). This is possibly also true in the corporate world as well. Acquisition of information on the environmental consequences of proposed actions will permit environmental values to be taken into account. The relative weight accorded to these values in the balancing analysis, however, especially when they conflict with the economic and technical factors, can only properly be gauged by analyzing the characteristics of the project outputs in relation to the planning inputs.

[24]Melvin Anshen and William D. Guth, "Strategies for Research in Policy Formulation," The Journal of Business, 46 (Oct., 1973), p. 510.

CHAPTER II

LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK OF THE STUDY

A. INTRODUCTION

The objectives of the research are twofold: 1) to describe the manner in which, and extent to which, ecological considerations have been incorporated into multinational corporate project planning; and 2) to identify on an exploratory basis the project, organizational, and public policy variables which appear to account for similarities and differences in the manner and extent of ecological incorporation as observed in (1). The project planning process of the multinational corporation is the unit of analysis, and in this study has been viewed in relation to its internal and external setting.

In order to accomplish these objectives a conceptual framework was developed from the literature. This framework has served to guide the collection, organization, analysis, and interpretation of data acquired in field interviews with executives of multinational firms in the chemicals, metals, and petroleum industries. One part of this framework consists of an operationalized construct entitled "ecological incorporation," which was created for purposes

of measuring and describing current planning behavior (objective 1). The second part of the framework consists of a contextual model of explanation which views "ecological incorporation" as a product of three interlocking influence systems. This model identifies the probable determinants of "ecological incorporation" (objective 2).

The conceptual framework of this study was derived from four major areas of theory and empirical research. The dependent variable of "ecological incorporation" was created by fusing two concepts: investment project planning and environmental impact assessment. The contextual influence variables, the independent variables of the study, were derived primarily from two areas: the impact of the external environment on the organization and the determinants of organizational innovation. Literature reviews of these four major areas are integrated at appropriate stages in this chapter, which sequentially develops the conceptual framework. Section B documents and creates the multidimensional dependent variable "ecological incorporation," section C presents and shows the derivation of the contextual model of explanation, and section D provides a brief summary of the complete conceptual framework.

B. DEPENDENT VARIABLE OF THE STUDY: "ECOLOGICAL INCORPORATION"

1. Introduction

The dependent variable of interest in this study is a multidimensional construct entitled "ecological incorporation," which pertains to the effective integration of ecological considerations into the succession of planning activities conducing to a new facility investment. The construct is derived from a fusion of the principles of effective preproject environmental impact assessment and the behavioral characteristics of corporate investment project planning. Each of these component concepts is briefly reviewed below. Following that the general meaning, various dimensions, and operational definitions of the construct are established in detail.

2. The MNC Project Planning Process

In the vast literature on corporate investment planning and decision-making, comparatively slight attention has been given to the actual behavior of firms in making decisions. Most of the literature is highly abstract, theoretical, and normative in character. Attention has rested largely with financial capital budgeting theory, prescriptive management science techniques and the determinants of investment.[1] Two notable exceptions are the behavioral studies by Bower[2] and Aharoni,[3] from which much of the review below is drawn.

The concern in this study is with quantum corporate investments, that is, important, discrete additions of physical facilities to a company's operating base. A firm's investment decisions are among the most consequential and difficult it makes. These decisions involve large sums of money, have long-lasting effects, and are usually made under conditions of high uncertainty or even ambiguity. The physical facility planning process is inherently future-oriented, strategic, and nonprogrammed in nature.[4]

The project planning process is defined here as the sum of the particular activities associated with, and procedures utilized in, the identification, design, and implementation of a new physical facility. The process can be viewed as one of anticipatory decision-making. It can also be considered as a design process involving the determination and implementation of substantive project content or definition.[5] "Design" is at the heart of project planning, as a location, input mix, scale, process technology and output pattern must all be chosen and woven together into an integrated package.[6]

The planning process leading to a facility investment consists of a complex succession of acts and a plurality of intermediate subdecisions. As Aharoni stresses:

> ". . . there is no one investment decision made at a specific point in time. Rather, there is a long process, spread over a considerable period of time and involving many people at different

> echelons of various organizations. Throughout this process, numerous 'subdecisions' have to be made. These 'subdecisions' usually reduce the degree of freedom of the decision-making unit and therefore influence the final outcome of the process. . . The conclusion--to invest or to reject an investment possibility--is only one step in a long sequence of decisions made during the process, and not necessarily the final one."[7]

Project planning is a dynamic, iterative process. The activities (or phases) are usually not carried out in a simple "textbook" sequential fashion, but rather in a recursive, simultaneous and sometimes discontinuous manner.[8] Nonetheless, it is useful to identify the various stages involved. Bower, in studying four major investment decisions in a large, widely diversified manufacturing firm, concluded that there are three general interrelated stages in the resource allocation process: the first is project definition,[9] the process by which the economic and technical characteristics of a proposed investment project are determined. The second is impetus,[10] that force that moves a project up the corporate hierarchy through various stages of approval to the third stage of final funding and authorization. For Bower, capital investment is a process of study, bargaining, persuasion, and choice.[11]

Aharoni, who has produced the only behavioral study of foreign investment planning and decision-making (an interview study of 38 U.S. manufacturing firms which had either invested or considered investments in an enterprise in Israel), found a complex and intricate reality involving the

interaction of elements of time, goals, uncertainties, commitment, information, roles, constraints, and a social system.[12] Aharoni, like Bower, did not find the decision-making process to be a sequence of deliberate, logical steps, beginning with a well-defined problem and proceeding through search of alternatives and consequences to a final decision. Instead, he found that the stages blend into each other and involve feedback loops and discontinuities. Aharoni cautiously outlined a generalized phase model of the process. The process typically proceeds from an initiating force, through a sequence pattern of investigation involving the creation of commitment, and then into a series of reviews and negotiations. Investigation is usually focused on a specific project for a specific country, and often involves a sequence involving first a preliminary screening using general indicators, then an on-the-spot investigation, and then more detailed studies of market size, technical feasibility, project design and production costs. The amount and complexity of the information gathered grows as the investigation advances.[13] Negotiations with outsiders, in order to receive approval and to reduce the impact of risk and uncertainty, begin when the company is generally at least tacitly committed to invest.[14]

In this study the focus will center on the complete life cycle of the project planning process--from conception through startup. Primary attention will be centered on the

intellectual aspects of project planning (i.e., the analytical aspects such as collecting and analyzing information, formulating alternatives, etc.), but some attention will also be given to various social processes involved (interaction with publics and governmental agencies, nature of participants, etc.). With reference to Bower and Aharoni, respectively, the attention will be primarily placed on the stages of project definition and investigation.

3. The Concept of Environmental Impact Assessment

The philosophical and methodological literature relating to the incorporation of environmental considerations into decision-making processes has emanated almost entirely from a public sector focus. The movement for prior assessment of ecological impacts can be viewed as a subset of the broader movement for "Technology Assessment."[15] Coates has defined this concept as:

> ". . . the systematic study of the effects on society that may occur when a technology is introduced, extended, or modified, with special emphasis on the impacts that are unintended, indirect, and delayed."[16]

In the broadest perspective, technology assessment is viewed as a systematic planning and forecasting process by which society, through its policy makers, may control and manage new technological developments.[17] As Laserson points out, it differs from the more traditional forms of analysis and prediction in four major ways:

> First, it is most directly concerned with second, third, and higher order impacts, as distinguished from the prime effects which are already pre-planned, intentional or costed out in the initial proposal. . . . Second, technology assessment incorporates the needs of an increasingly wide range of constituencies. . . . Third besides being 'multi-constituencied,' technology assessment is interdisciplinary . . . and Fourth , unlike other methods of analysis, technology assessment is seen not as a technical device, but as a policy-making tool.[18]

Turning now to environmental impact assessment (usually viewed as a more circumscribed version of technology assessment), we can trace the impetus for this type of analysis to the U.S. National Environmental Policy Act (N.E.P.A.) of 1969 (Public Law 91-190), which among other things, prescribed specific "action-forcing" provisions requiring federal agencies to give full consideration to environmental effects in the planning of their projects and programs.[19] N.E.P.A. was intended to make federal agencies more responsive to environmental considerations and values, which had been too frequently neglected in governmental decision-making. The most significant (and indeed most controversial) procedural demand of N.E.P.A. was that of Section 102(2)(C), which requires all federal agencies to prepare a "detailed statement" of environmental impact for every major federal action "significantly affecting the quality of the human environment."[20]

Section 102(2)(C) specifies that environmental impact statements must cover five points:

(i) the environmental impact of the proposed action,
(ii) any adverse environmental effects which cannot be avoided should the proposal be implemented,
(iii) alternatives to the proposed action,
(iv) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and
(v) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.[21]

The environmental impact statement must be available to other interested federal, state, and local agencies and to the public, and must "accompany the proposal through the existing agency review process."[22] Although compliance with the impact statement provision does not assure that a federal action will have a minimal adverse affect on the environment,[23] it has generally been seen to have had a profound impact on agency decision-making.[24]

To comply with the requirement, the governmental agencies and those private firms which depend on approvals or licenses from these agencies, have had to develop methodologies and protocols for analyzing environmental impacts. These various frameworks and procedures, some developed by the agencies themselves, others by consultants hired by the agencies, and still others by academic resaarchers, have come to be known as tools of "environmental impact assessment."[25]

As revealed in these definitions by Aggerholm and Andrews, respectively, environmental impact assessment is essentially a predictive process:

> Environmental impact assessment includes the identification, description, and evaluation of significant predicted environmental and related changes (impacts) resulting from a proposed action or actions . . . in essence, an environmental cause-effect analysis.[26]

> In a nutshell, it is the forecasting of probable consequences of alternative packages of actions upon resource functions having value in natural and social systems.[27]

At first, environmental impact assessment was viewed narrowly as a means of producing the legally required statement. Court interpretations transformed its purpose into a means of providing full disclosure and additional information for decision makers. A broader view of impact assessment as a new concept of planning analysis has been emerging recently.[28]

In this broader perspective, impact assessment is essentially perceived as a thought process for empirically predicting the consequences of alternative project actions. In the context of this project planning analysis view, Andrews has pinpointed six principal tasks involved in impact assessment:

> Evaluative Factors: the identification of those variables that are of particular importance in the planning situation at hand (i.e., "evaluative factors," or alternatively "resource functions").

> Systems Description: the identification of the relationships among the evaluative factors, or resource functions, that have been identified.
>
> Alternatives: the formulation and study of alternatives on the basis of differences in expected effects on multiple evaluative factors.
>
> Forecasting of Effects: the prediction of changes resulting from the introduction of alternative intervention systems, or "packages" of actions into the system.
>
> Display: the display of the differences (or "trade-offs") among the alternatives, in terms of the evaluative factors and ideal future scenarios envisioned by the various affected publics.
>
> Evaluation: the evaluation of the differences among alternative sets of actions, and among the alternative future scenarios to whose fulfillment they contribute; and a decision or recommendation of which to adopt.[29]

Philosophical principles to guide, and techniques to be used in, the analytical tasks of impact assessment as outlined above have been evolving rapidly during the last few years. Guiding principles such as: impact assessment must be an ongoing process, integrated into the entire planning process,[30] impact assessment should be performed by an interdisciplinary team of natural and social science professionals,[31] impact assessment should be comprehensive in its coverage and be guided by a truly holistic, ecological point of view,[32] impact assessment should be concerned with the environmental perceptions and values of affected groups,[33] and impact assessment should involve systemic analysis,[34] are embodied and expanded below in the dimensions of the dependent variable of this study, ecological

incorporation. Numerous frameworks and techniques, which vary considerably in their assumptions, complexity and usefulness, have been developed.[35] Checklist guidelines,[36] cause effect matrices,[37] cross impact matrices,[38] network diagrams,[39] multiple stepped matrices,[40] input-output analyses,[41] suitability/compatibility matrices,[42] simulations,[43] and weighted hierarchical systems[44] have been advanced as procedures useful in implementing the tasks of environmental impact assessment.

4. Ecological Incorporation: A Multidimensional Construct

a. General meaning of ecological incorporation

Ecological incorporation is an abstraction which is derived from an application of environmental impact assessment principles to the MNC project planning process. It conveys a general meaning, but is not directly observable. It is not a unitary concept but has, in essence, a number of submeanings which can be conceptualized as dimensions. For each of the dimensions, we provide operational definitions consisting of multiple indicators.

Ecological incorporation pertains to the effective integration of ecological considerations into the succession of activities involved in project planning. In general terms, ecological considerations are factors, criteria, variables, or values having to do with the patterns of relationships between living things and their physical

environment.[45] The concern in this study is with the quality of environmental resources such as air, water, and land, which are major components of ecological systems and perform valuable services for man. In the context of the project planning process, ecological considerations would thus include all matters relating to the impacts of project actions (primarily the discharge of gaseous, liquid, and solid residuals) on these various environmental resources.

It is important to note that the attention here is with ecological incorporation in the project planning process, not with the physical facility outcome of that process. The focus is on the inputs to, and means employed in planning, rather than on the outcomes, largely because of the noncomparability of outputs (i.e., facilities) of the three industries to be studied. A study of the characteristics of the planning processes which lead to the outputs was deemed to be more manageable and comparable. It is posited, however, that a strong positive relationship exists between environmentally sound project planning and environmentally sound project outputs. This assumption appears reasonable on the basis of available planning theory, but will not be directly tested in this research.

Ecological considerations can be said to be effectively incorporated into the project planning process when the following kinds of inputs and/or means are present: utilization of information and analytical inputs concerning

ecological impacts and values; participation of environmental science professionals and affected publics; resources (human, time, and financial) expended in gathering, processing, interpreting, and communicating ecological impact information; comprehensive purposeful, and systematic pre-project environmental research, evaluations, and reviews; environmentally-oriented search behavior for project action alternatives, etc. These inputs and/or means can either be present currently in the planning process or embodied in the planning process as a result of accumulated past experience and know-how.

A high level of ecological incorporation would imply, in a probabilistic sense at least, that the project planners are more likely to have considered matters beyond the immediate economic, technical and political impacts of a proposed project. It would also imply that the planning participants are more likely: 1) to have engaged in the intellectual exercise of answering the question: "what impact will this project have on the environment?" 2) to have been sensitive to social values concerning the use and quality of environmental resources, and 3) to have accorded continuous, careful thought and attention to environmental effects and costs during the course of planning. As to the actual weight given to environmental values in the decisional equation, and therefore in the project output (i.e., economic and technical benefits versus environmental costs), one

must once again resort to contention and posit that the greater the resources expended on ecological incorporation during project planning, the greater will probably be the weight accorded to environmental values in the balancing analysis.

b. Manner of ecological incorporation

Ecological incorporation represents a multidimensional construct. The manner of ecological incorporation refers to questions of how, when, who, what, and where. These questions relate to the presence or absence of inputs and/or means as discussed above, and have been translated into six dimensions of ecological incorporation, which will be presented shortly. These multiple dimensions are viewed as functional alternatives or different paths to the same thing--the integration of ecological considerations into the planning process. These dimensions are only partial representations of the underlying concept and can each vary in the extent or intensity to which they are utilized. The use of multiple dimensions was deemed essential partly because of the nonexistence of a single, unambiguous and direct operational definition of the theoretical construct which could be obtained and defended at this point in time.[46] The six chosen dimensions and their working measures follow below.

1) Professional involvement.--This dimension is concerned with the nature and range of environmentally-oriented participant skills and competencies utilized in the project planning process. Effective incorporation of a broad range of environmental concerns requires an interdisciplinary perspective and the involvement of qualified personnel in the natural, physical, and social sciences.[47] Involvement of a variety of individuals with different, but relevant professional backgrounds (e.g., from the disciplines of ecology, biology, sociology, geography, social psychology, landscape architecture, pollution control engineering, political science, etc.) is likely to facilitate a greater awareness and knowledge of environmental concerns, as well as to extend the degree of search and increase the diversity of alternatives considered.[48] This is so because the infusion of such professionals, who possess varying perception apparatuses, memories, values, images of the world, and commitments will generally serve to contribute diverse ideas, create constructive tensions and to help take off the "mental blinders" of the old-line project planning operatives. The involvement of professionals external to the firm will help to guard against the "insider viewpoint," via their relative detachment and objectivity.

Four measures of professional involvement are used:

a) was there significant current involvement of internal corporate environmental staff?

b) was there significant current involvement of external environmental professionals?

c) was there significant current involvement of multidisciplinary environmental expertise?

d) was there significant previous involvement of environmental science professionals in dealing with the environmental aspects of this kind of project?

2) Systematization.--This dimension is concerned with the utilization of systematic, analytical techniques and procedures in the review and consideration of environmental factors during project planning. Effective incorporation of issues as complex as those encountered in environmental issues requires rational systems for analysis. The complexities involved in the identification, prediction, description, and evaluation of environmental impacts and the need for a decisional orientation would appear to imply that the application of various analytical methods could be especially useful (e.g., baseline surveys of environmental conditions prior to introducing changes, formal impact assessments, residuals and environmental media monitoring, etc.).[49] Just as systematic procedures for engineering and economic evaluation have been found to be essential in sound project planning, so too is it necessary to utilize environmental procedures that are systematic and fully replicable.

Five working measures of systematization are employed:

a) was a prestartup ecological baseline survey or inventory done?

b) was a formal preproject predictive environmental impact assessment done?

c) was a program of residuals monitoring made part of the project?

d) were provisions for periodic monitoring or post-audits of site location environmental media made?

e) had significant environmental investigations and analyses regarding the environmental aspects of this kind of project been done previously?

3) Inclusiveness.--This dimension is concerned with the scope of environmental impact considerations reviewed and evaluated during project planning. Effective incorporation requires a relatively complete examination of the impacts of all proposed project actions (e.g., construction, structures, inputs, outputs, etc.), taken individually and in total, on all valued environmental resources (e.g., air, water, land, sound waves, etc.), taken individually and in total.[50] Inclusive ecological incorporation would imply that the environmental setting into which the project is going to be introduced has been examined comprehensively. It would also imply that ecological considerations have served as inputs in all major project action subdecisions from which environmental impacts may result. Comprehensive investigations of the environmental setting and inclusion of environmental impact concerns in all major project action subdecisions would serve to greatly facilitate the

development of environmentally-oriented project alternatives.

Five working measures of inclusiveness are utilized:

a) were the prestartup environmental investigations comprehensive in nature?

b) were ecological factors a prime consideration in the site evaluation and selection procedure?

c) was significant current planning effort expended in considering ecological impact factors in the process technology evaluation and selection procedure?

d) was the consideration of causative project actions comprehensive in nature?

e) had significant previous engineering efforts been expended in order to solve the environmental problems associated with this kind of project?

4) Public participation.--This dimension is concerned with the efforts (direct and indirect) expended in order to obtain the views of, and to inform, the publics which may be affected by the project. Effective ecological incorporation requires an awareness and understanding of social values concerning the use and quality levels of environmental resources which may be impacted as a result of the proposed project.[51] It requires that the values, concerns, perceptions and knowledge of those affected (and of those who will decide on and regulate the project) be actively sought out. "Considerations of equity suggest that groups that have traditionally been left out of the design and choice process (and who are affected by the project) be

actively included, kept well informed, and be given a chance to affect the project."[52] Effective public participation would serve to make the project planning more sensitive and responsive, would facilitate the integration of community needs and desires into project design, and would tend to extend the degree of search and increase the diversity of project action alternatives considered.[53]

Six working measures of public participation are utilized:

a) were locally-based consultants utilized during the course of project planning?

b) was a formal survey of local environmental quality perceptions and values conducted?

c) was advice from the community and from citizen environmental groups actively sought?

d) was a comprehensive information program for the community initiated?

e) were special educational efforts for governmental officials and/or citizen environmental groups initiated?

f) had significant previous interaction with communities, citizen environmental groups and/or governmental environmental agencies regarding the environmental impact aspects of this kind of project been experienced?

5) Continuousness.--This dimension is concerned with the temporal integration of ecological considerations into the various phases of project planning. Effective incorporation requires that consideration of environmental impacts be an ongoing activity throughout the process of planning.[54] Environmental information should be available

at all relevant points in the planning process where alternatives with different ecological consequences are being evaluated and decided upon. The potential influence of an outsider or idea increases the earlier he or it enters into the planning process. "Early consideration of environment will avoid overlooking critical factors, allow incorporation of critical design features, enhance acceptance of plans developed, stimulate wider consideration of alternatives and protect basic environmental components."[55] Continuous incorporation should serve to make it possible to mitigate or prevent undesirable effects by incorporating more stringent pollution control technologies, redesigning the project, selecting another site, etc.

Three working measures of continuousness focusing on early integration are utilized:

a) was there early citizen awareness and participation in project planning (well before any formal hearings and permit applications)?

b) was the ecological baseline reconnaissance done early in project planning (before the project design was finalized)?

c) were significant environmental inputs available early in project planning by virtue of previous project planning experience in which environmental impact issues had been involved?

6) Formalization.--This dimension is concerned with the degree to which formal rules and procedures for including ecological considerations in the project planning

process have been established internally within the organization. Effective incorporation requires that formal procedural guidelines and clearance/review procedures be established for dealing with the environmental impact aspects of new projects.[56] Formalization would tend to introduce an internal sense of "accountability" and would contribute to more careful and conscientious project planning with regard to environmental concerns.

Three working measures of formalization are employed:

a) was there a separate section of the project proposal which dealt with environmental problems and a separate section of the capital appropriations request form which dealt with environmental spending?

b) was there a formal and separate environmental review and approval by top management?

c) was there a formal and separate environmental review and approval by the corporate environmental staff?

c. Extent of ecological incorporation

The above six dimensions of ecological incorporation are in fact variables, and it is possible for a project planning process observed within an organization to be ranked on each with respect to the degree of the characteristic evidenced. Each of the six are ordinal measures, on which position can be identified in a rank order, but with no absolute implication as to the distance between positions.[57] Each is a composite variable, consisting of working measures on which an answer of either yes, partly, or no

is possible. For each, a continuum ranging from less to more of the particular characteristic can be envisioned, with placement on the continuum a function of its composite score (i.e., the summation of assigned scores on the working measures where an answer of yes = 1, partly = ½, and no = 0).

d. Composite index of ecological incorporation

In later chapters of this study, analysis of the data will to some extent involve the use of the six individual dimensions as well as "profiles" formed by the positioning of the planning processes on the six dimensions. Of greatest use, though, is a composite index of ecological incorporation constructed by summing the ratings achieved on those scales remaining after item-analysis procedures are conducted to test for internal consistency. By default, equal weights are given to the qualifying scales, as theory does not provide a basis for assigning relative weights. The purpose of the composite index (actually a composite of mini-composite variables) is to summarize into one measure the power of a number of indicators, which will hopefully represent the construct more accurately than any one of them could possibly do. The composite measure will be able to handle cases in which the firm has adjusted in one area to compensate for excesses or deficiencies in another. In essence, it is postulated that the same amount or "score" of ecological incorporation may be reached by different paths.

C. INDEPENDENT VARIABLES OF THE STUDY: PROJECT NATURE, ORGANIZATION, AND PUBLIC POLICY

1. Introduction

The discussion above outlined the way in which ecological incorporation behavior is to be measured and described. Attention in this section shifts to the means for explaining this behavior. It is posited that the ecological incorporation embodied in a project planning process is closely related to the contextual setting in which it functions and that much of the variation in incorporation behavior may be explained by variation in contextual influences. The explanatory model draws on two major areas of theory: the impact of the external environment or milieu on the organization, and the determinants of organizational innovation. Each of these areas is reviewed briefly for its contributions. The contextual model is then developed in full and the characteristics of the variables to be examined are discussed. The final part of this section spells out the specific explanatory hypotheses to be tested and provides brief background theoretical support for each.

2. Impact of the External Milieu on the Organization

The literature on the external milieu[58] of an organization and its direct and indirect impact upon organizational structures, processes and outcomes is in a formative state. The current relevant theory on these impacts is

rather incoherent and diffuse, since this area of organizational analysis has been relatively neglected. In a recent review of this area Azumi and Hage conclude: "There is as yet no definitive work that states precisely what it is about the environment that has an impact on the organization and what processes are actually involved in it."[59]

This study adopts an "open systems" conception of the multinational enterprise.[60] In this view, the organization is seen as importing various things from its external surroundings (e.g., raw materials, people, energy, information) utilizing these imports in various kinds of conversion processes, and then exporting the results (e.g., products, services, waste materials) back into the external environment. The nature of the firm's external transactions is the critical dimension, and its viability or survival over time hinges upon its ability to adapt to the dynamic forces operating in its external milieu. With special relevance to this study, the "open systems" conception recognizes that the external milieu is a major stimulant for change. Katz and Kahn write:

> "The basic hypothesis is that organizations and other social structures are open systems which attain stability through their authority structures, reward mechanisms, and value systems, and which are changed primarily from without by means of significant change in inputs. Some organizations, less open than most, may resist new inputs indefinitely and may perish rather than change. We would predict, however, that, in the absence of external changes, organizations

> are likely to be reformed from within in limited ways. More drastic or revolutionary changes are initiated or made possible by external forces."[61]

Various organizational theorists have focused on the properties of the external milieu which seem to be important for organizational structure and functioning. Emery and Trist have examined the textures of the task-relevant external environments of organizations and have concluded that these textures are themselves changing at an increasing rate and towards increasing complexity (i.e., organizations are increasingly confronted with "turbulent" environments).[62] After having examined the evolution of organizational environments, Terreberry hypothesized that organizational change is largely externally induced by forces in the environment. She also hypothesized that organizational adaptability is a function of the ability to learn and perform according to changing environmental contingencies.[63] Buckley has described the four qualities required for successful organizational adjustment, with the ability to reflect or "map" the environment being the most important.[64] Child has postulated three conditions of the external environment which appear to be critical for organizational processes: 1) <u>environmental variability</u> (i.e., the degree of change which characterizes environmental activities relevant to an organization's operations); 2) <u>environmental complexity</u> (i.e., the heterogeneity and range of environmental activities which are relevant to an organization's operations); and

3) environmental illiberality (i.e., the degree of threat that faces organizational decision-makers in their achievement of their goals from external competition, hostility, and even indifference).[65] Aspects of these conditions have been deemed relevant for explaining ecological incorporation and are translated into various independent variables later in this section.

Various scattered empirical studies have focused on the influence of the external milieu on the organization. Dill has found managerial autonomy to be affected by environmental pressures.[66] Simpson and Gulley reported that voluntary organizations with diffuse environmental pressures had more decentralized structures and higher internal communication, while those with specific and restricted pressures had the opposite characteristics.[67] Lawrence and Lorsch have studied the influence of the external environment on the differentiation and integration of organizational functional units. They found that the more certain the subenvironment, the greater the formalization of structure in the subsystem. They concluded that different configurations of organizational structure are required to cope with different environmental conditions.[68] The research of Crozier, and Harbison and Myers, has shown that variation in organization behavior can be expected to follow from variation in the cultures from which organizational members are drawn.[69] Duncan has studied the characteristics of

environments with respect to perceived environmental uncertainty and found that perceived uncertainty is greatest when the decision unit faces a complex, dynamic environment.[70]

Other organizational behavior researchers have focused on the problems and patterns of interorganizational interaction.[71] The web of relationships between an organization and its competitors, suppliers, customers, unions, pressure groups and regulators is vast and complicated. Evan has examined the nature of an organization's external environment in terms of "organizational sets,"[72] while Warren, and Levine and White have utilized the concept of "exchange" or transactional interdependencies in examining interorganizational relations.[73] Aiken and Hage have found a positive relationship between innovative behavior in an organization and its interdependence with the environment.[74] Interactions between organizations may involve flows of information, of goods, of influence, or of personnel. To carry out these interactions, "boundary spanning roles" are created; these men negotiate the transactions with other organizations and in turn keep their organization members informed.[75] Much of the attention in this study, in both dependent and independent variable analysis, deals with this phenomenon of interorganizational interaction.

Little is known at present about how organizations adapt to social pressures such as ecology, minority

employment, consumer protection, etc. The only research known to this author is that of Ackerman.[76] In examining the social response process in a number of firms, he found that the process starts with attempts from the top to accomplish change, and ends, if the organization is adaptive, with the institutionalization of the new corporate social policy at the operating level. The conversion of social responsiveness from policy to action involves various phases including top management concern, creation of staff specialists to handle the problem, and finally full integration into operating divisional management. Ackerman also notes the incompatibility of social responsiveness with traditional systems of structural context; to bring about an effective institutionalization of social responsiveness requires that the reporting system and executive performance, evaluation and reward systems be made conducive to such ends.[77] Ackerman's model of the response process has been confirmed in this study and is explored in greater detail in Chapter VI.

3. Determinants of Organizational Innovation

Ecological incorporation can be viewed as an instance of innovative behavior on the part of the corporation. It is an administrative innovation concerning inputs and means not previously included in the repertoire of project planning. It is also an instrumental innovation, concerned

with specific procedural changes that are intended to make possible the introduction of an ultimate innovation--an environmentally sound industrial project. This conception of ecological incorporation is consistent with Mohr's definition of innovation as being "the successful introduction into an applied situation of means or ends that are new to that situation,"[78] or with Wilson's definition of innovation as being "a fundamental change in a significant number of tasks."[79]

There has been much research on the variables and conditions affecting the process of innovation adoption, but it consists largely of scattered projects representing disciplines such as anthropology, sociology, agriculture, education, technology, communication, etc.[80] Recent efforts have been made to develop a synthesized theory from a business firm perspective.[81] The reader is referred to these sources for a thorough review of organizational innovation theory.

In general terms, the impetus to organizational innovation arises when organizational decision-makers perceive that the organization's present course of action is unsatisfactory. This discrepancy between what the organization is doing and what its decision-makers believe it ought to be doing has been called a "performance gap."[82] These gaps may arise from changes in the organization's external milieu (e.g., market conditions, technological

processes, public attitudes, government regulations, pressure group demands, etc.). Perception of a performance gap will usually give rise to organizational pressures to close the gap and "problemistic search" behavior (for alternative courses of action) will be triggered.[83] The performance gap has to be great enough to overcome the powerful forces of inertia at work in the organization. There is a powerful tendency for organizations to continue doing today whatever they did yesterday (i.e., giving greater attention and reinforcement to alternatives that represent a continuation of present programs). Whether or not an innovation discovered through search behavior is adopted depends critically on the "relative advantage" of the innovation (i.e., the degree to which it is perceived as being better than the idea it supersedes).[84] Organizations will rationally adopt new patterns of behavior only if the perceived benefits exceed both the costs of changing to the new pattern and the benefits derived from the existing pattern.[85]

External variables have generally not played a large role in innovation theory and research. A few notable exceptions stand out, however. Rosner has observed that "organizations adopt innovations in order to become better adapted to their environment or to improve their chances of achieving their goals."[86] Miller has studied how innovative and sluggish American and Western European steel firms managed their interdependency relationships with the

technological task environment, structured themselves for technological (new process and product) innovation, and by doing so attained differential levels of performance.[87] An organization is more likely to innovate when its relevant environment is changing rapidly than when it is steady, because performance gaps will appear more frequently and expand faster under the former condition.[88] Innovation is also more likely when the larger social environment to which the organization belongs has norms that favor change than when its norms do not favor change.[89] In considering the influence of the environment, Wilson offers an important caveat:

> Environmental changes that to the outside observer 'objectively' seem to 'require' innovation by the organization, are likely to lead to such innovation only insofar as these changes alter the preferences of members for incentives (by changing present or prospective costs or benefits of participation in the organization).[90]

Most of the theory and research on the factors predisposing an organization toward innovation concentrate on internal organizational variables.[91] Becker and Whisler list the following internal variables which influence the process of innovation: slack, unprogrammed goals, subcultures, external affiliations, diversity in task structure, self-actualizing personalities, leadership style, and open communications.[92] Hage and Aiken have examined the influence of organizational structure on program innovation.

They see the rate of innovation as directly related to the degree of complexity and job satisfaction in the organization, and inversely related to the degree of centralization, formalization, stratification, production emphasis, and efficiency emphasis in the organization.[93] Additional correlates of organizational innovation will be identified in the support sections of each of the explanatory hypotheses which follow.

4. Contextual Explanation of Ecological Incorporation

a. The tradition of contextual analysis

Contextual analysis is a method used to explain behavioral patterns in terms of the social contexts in which individuals, groups, or organizations function. It focuses on properties of the contextual setting which presumably influence behavior and assumes that behavior will be adapted to its context. If the behavior is not consonant with its setting, then opportunities are lost, costs rise and the maintenance of the individual, group, or organization is threatened. It is posited in this study that the state of ecological incorporation in a project planning process is closely related to aspects of the context in which it takes place and that it represents a behavioral adjustment in response to different contextual conditions. The analysis begins with observed variation in the dependent variables, ecological incorporation, and proceeds to account

for this variation through examination of its covariation with various independent variables. Although the analysis includes contextual factors, which may indeed be causal in character, the cross-sectional nature of this study will only enable us to establish salient relationships. Causes should be inferred from a theory that generates a dynamic model about changes in ecological incorporation in response to changing contextual factors over time.

Contextual analysis has frequently been employed in the study of foreign policy and comparative politics.[94] Snyder, Bruck, and Sapin focused on the influence of the "internal setting" and "external setting" in the making of foreign policy choices.[95] Bauer, de Sola Pool, and Dexter relied heavily on contextual explanation in their study of corporate influence on public policy.[96] Contextual analysis also has recently become a popular method in the study of organizational structures. Pugh, et al., have suggested a number of contextual variables (e.g., origin and history, ownership and control, size, charter, technology, location, resources, and interdependence) which may be regarded as determinants of structural patterns.[97] They offer an interpretation of organization structure as being a product of primarily economic constraints which are assumed to be imposed by contextual variables. Other researchers have focused their attention on the influence of individual

contextual variables such as size and technology on organization structure.[98]

The tradition of contextual explanation is perhaps strongest in the study of capital investment decision-making behavior. This focus was central in both the Aharoni and Bower studies reviewed above. Aharoni stated:

> The perception of problems to be analyzed, the alternatives from which a choice is made, the additional data collected, and the way it is scrutinized--all depend to a large degree on the social system in which the decision makers operate.[99]

Aharoni identified a series of leverage points by which top management may influence the path and outputs of the investment process. These include strategy, roles, participants, patterns of interaction, and information system.[100]

Bower found both project definition and impetus to be influenced by context. He defined context as the set of forces, structural and situational, which act as principal influences or points of leverage over what happens in the processes of definition and impetus.[101] The structural context is subject to the control of top management and includes the formal organization, information and control systems, and measurement and reward systems. The essential role of context was explained as follows:

> The role of structural context is that it shapes the purposive manager's definition of business problems, by directing, delimiting and coloring his focus and perception; it determines the priorities which the various demands on him are given. Structural context has this role because it is

> the principal way in which the purposive manager learns about the goals of the corporation.[102]

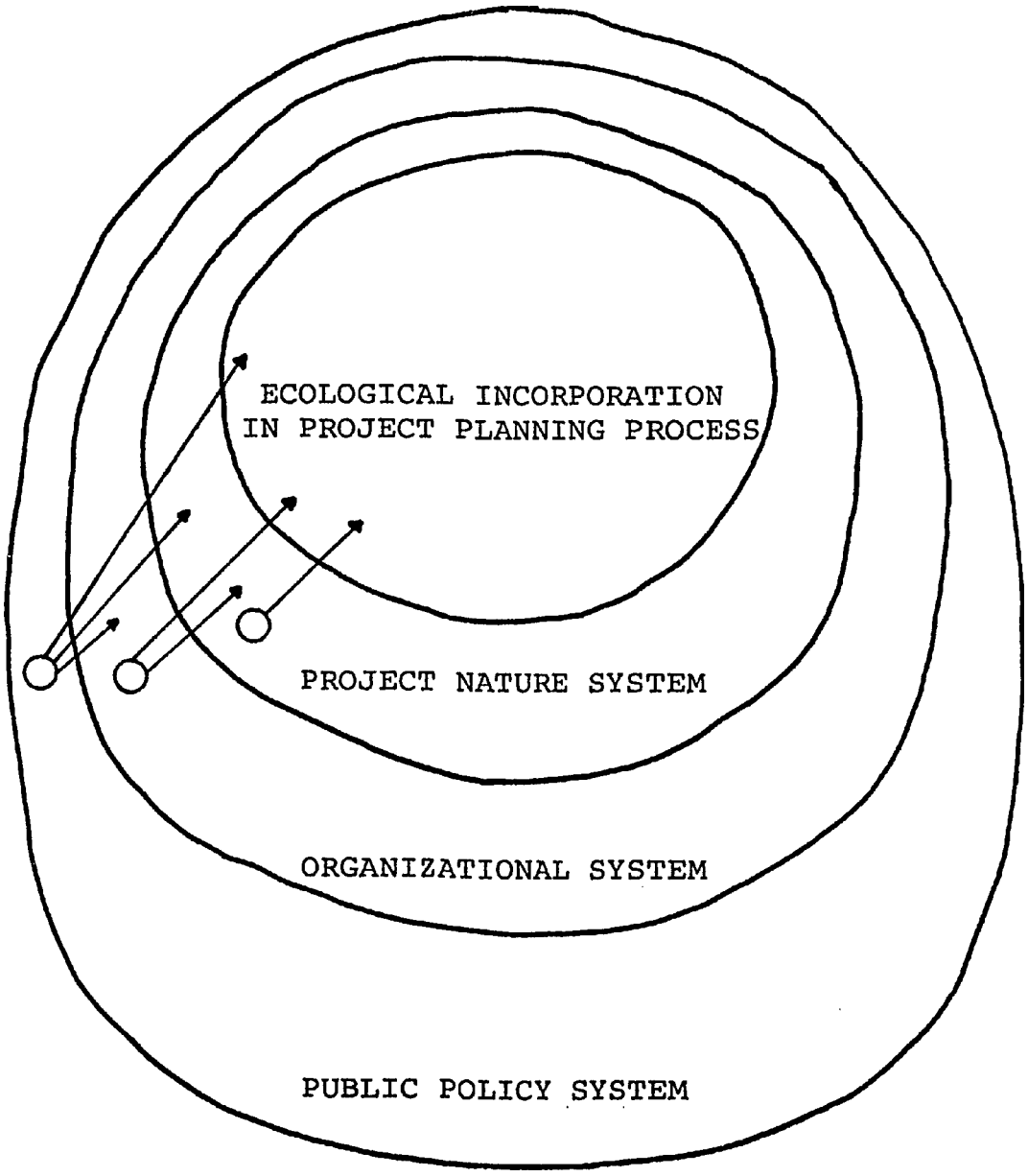
b. The contextual explanatory model

The postulate that behavior is a function of the interaction of organism and environment is widely accepted, and both its theoretical and practical implications have been explored.[103] Contextual conditions affect organizational behavior by determining stimuli, by restraining freedom of response, and by rewarding and punishing behavior. Mohr has suggested that innovative behavior is a function of an interaction among the motivation to innovate, the strength of obstacles against innovation, and the availability of resources for overcoming such obstacles.[104] The contextual explanatory model employed in this study is derived from ideas expressed above; it focuses on multiple variables that possess a capacity to exert a substantial influence over the extent to which project planning behavior is ecologically oriented.

The project planning process is viewed in this study as an entity embedded in three nested, interlocking contextual influence systems: the project nature system, the organizational system, and the public policy system. Figure II.1 provides a model of this influence system structure. The arrows indicate the channels along which influence can flow. The public policy system can affect ecological incorporation either directly or indirectly through its influence

FIGURE II.1

STRUCTURE OF CONTEXTUAL INFLUENCE SYSTEMS



on the organizational and project nature systems. Likewise, the organizational system can exert either a direct influence or an indirect influence on ecological incorporation. The arrows in Figure II.1 only point inward, but for conceptual purposes it is important to note the possibility of counter-influence. For example, external public policy may be shaped, at least in part, by the influence of powerful firms or industry groups or by the kinds of projects being proposed in the public policy jurisdictional area. In short, the transmission belts of influence can run both ways, but the focus of this study will primarily rest with the "inward influence." One additional note--the model should not be interpreted as one of "contextual determinism;" only a probabilistic or functionalist model is implied. We will only be able to state that a particular contextual variable appears to matter, and that it seems to be an important factor which, if present, makes probable the concomitant occurrence of ecological incorporation behavior. Our interest lies with pinpointing the patterns of project nature, organizational, and public policy factors which tend to be associated with certain levels of observed ecological incorporation.

c. The character of contextual variables

The contextual variables selected for examination in this study are presented in Exhibit II.1. As is apparent,

EXHIBIT II.1

CHARACTER OF CONTEXTUAL EXPLANATORY VARIABLES

(part. = partly) System/Variables	Original		Situational	
	Internal	External	Project Specific	Non-Project Specific
Project Nature System				
Project type	yes	-	yes	yes
Project cost	yes	-	yes	-
Project year	yes	part.	yes	-
Site location type	yes	-	yes	-
Project ownership	yes	part.	yes	-
Organizational System				
EC objectives & top management commitment	yes	-	-	yes
EC role assignment	yes	-	-	yes
EC performance measurement	yes	-	-	yes
EC research & technology programs	yes	-	-	yes
EC external surveillance & interaction	yes	part.	-	yes
Company profitability	yes	-	-	yes
Company size	yes	-	-	yes
Company investment intensiveness	yes	-	-	yes
Public Policy System				
Home country environmental policy	-	yes	-	yes
Host country environmental policy	-	yes	yes	-
Public project examination	-	yes	yes	-
Project-associated public pressures	-	yes	yes	-
Environmental conflict experience	part.	yes	-	yes

continued--

EXHIBIT II.1--continued

System/Variables	Temporal			Functional		
	Past	Present	Future	Motivation	Resource	Obstacle
Project Nature System						
Project type	-	yes	part.	yes	part.	part.
Project cost	-	yes	part.	yes	part.	part.
Project year	part.	yes	-	yes	part.	part.
Site location type	part.	yes	part.	yes	part.	part.
Project ownership	-	yes	part.	part.	yes	yes
Organizational system						
EC objectives & top management commitment	-	yes	yes	part.	yes	part.
EC role assignment	-	yes	-	part.	yes	yes
EC performance measurement	-	yes	part.	yes	-	-
EC research & technology programs	part.	yes	part.	part.	yes	yes
EC external surveillance & interaction	part.	yes	yes	-	yes	yes
Company profitability	yes	yes	yes	-	yes	yes
Company size	yes	yes	-	-	yes	yes
Company investment intensiveness	yes	yes	part.	-	yes	yes
Public Policy System						
Home country environmental policy	yes	part.	part.	yes	part.	part.
Host country environmental policy	part.	yes	-	yes	part.	part.
Public project examination	-	yes	-	yes	-	-
Project-associated public pressures	-	yes	-	yes	-	-
Environmental conflict experience	yes	-	-	yes	-	-

the research has involved a scanning of multiple variables in each of the three influence systems. The exhibit provides a summary description of the character of the independent variables examined. The character of the variables differs on four major dimensions: original, situational, temporal, and functional.

Some of the variables originate from within the organization, while others originate externally. We view the project nature and organizational variables to be basically endogenous and the public policy variables to be basically exogenous. Half of the contextual variables are project-specific in their nature. These obviously include all of the project nature variables and most of the public policy variables. The rest of the explanatory variables are not specifically linked to the project in question; they could exist and exert influence independent of the project examined in this study.

Although data collection was done cross-sectionally at one point in time, the variables are reflective of different temporal influences. Most of the variables do relate to coexistent influences. A few, however, reflect the influence of prior system states, such as antecedent conflict experience, size, profitability, and home country environmental policy. The influence here is deemed to be predominantly genetic in kind. In addition, some of the variables reflect the influence of future system states,

such as host country environmental policy and attainment of corporate environmental control objectives. In many cases the individual variables reflect concurrent temporal influences (i.e., the same variable may relate to past, present, and future system states). In short, the extent of current ecological incorporation behavior may be a function of the influence of preceding experience, contemporaneous factors, and/or anticipated conditions.

The variables serve different functional roles, although various multiple roles may be served concurrently by the same variables. Some of the contextual variables are predominately motivational in character and therefore serve to initiate ecological incorporation behavior. Other variables serve as resources which aid in making such behavior feasible. Still other variables may serve as obstacles to such innovative behavior. The most obvious type of obstacle would be the relative absence or inadequacy of a resource; this is reflected in Exhibit II.1 by the potential resource or obstacle role of many of the variables.

5. Explanatory Variables and Hypotheses of the Study

a. Summary hypothesis

In summary form the central explanatory hypothesis addressed in this study is as follows:

> The extent of "ecological incorporation" embodied in a given multinational corporate project planning process is a function of an interaction among: 1) the nature of the project, 2) the organizational context of the project planning process, and 3) the public policy context of the firm and the given project being planned.

The validity of this summary hypothesis will be determined by testing the component hypotheses found below and examining the interrelationships among them.

b. The influence of project nature

It is hypothesized that the extent of ecological incorporation is directly related to the nature of the project being planned. Five variables have been selected for examination. For each the exact hypothesis to be tested and a brief discussion of the theoretical support is now presented.

1) Project type.--The greater the relative severity and range of potential adverse environmental impacts associated with the type of project, the greater will be the ecological incorporation embodied in the project planning process.

Industrial projects differ widely in terms of the "package" of environmental impact-causing actions entailed. Complex, large-scale, and residuals discharging projects, for example, might involve a broad array of major causative actions, while projects of a smaller scale and non-residuals discharging kind might involve only a few minor causative actions. Variation in the nature and extent of entailed causative actions implies concomitant variation in the

magnitude and significance of associated environmental consequences. Actual consequences depend, however, on the complex interaction of a large number of social, economic, and physical variables, many of them stochastic in nature. The consequences of residuals discharge actions would depend on the timing of the discharge, the extent to which the discharge is naturally degradable, the absorptive and dispersal capacity of the receiving environmental media, the location of human, animal, and plant receptors which may be affected by the discharge, the presence of other discharges and synergistic interactions among them, etc.[105] The above complexity notwithstanding, one would expect greater attention to be given to environmental factors during the course of project planning when a project entails a broad, rather than a narrow, range of potential impacts and when the impacts are perceived to be more, rather than less, severe. The governmental laws and regulations applicable to, and the intensity of public resistance accorded to, an industrial project would tend to vary directly with the relative severity and range of potential adverse environmental impacts associated with the project.

2) Project cost.--The greater the total cost of the project, the greater will be the ecological incorporation embodied in the project planning process.

The greater the total cost of the proposed project, the more consequential the project probably is to the

corporation. Greater top management attention will usually be focused on those projects involving greater resource commitment. Perceived risk may be greater for high cost projects as compared to low cost ones. Greater efforts to reduce the firm's exposure to risk and uncertainty, including efforts to make sure the project is not blocked or delayed by environmental impact objections, may thus be expended.[106] There are likely to be decreasing costs of search per unit of investment, as the proposed scale of the investment increases.[107] This may be true for both environmental alternatives and consequences search behavior. There may be more "slack" in the project planning budgets of high cost projects versus low cost ones. Environmental research projects may thus be funded more easily and frequently in those projects where the total expenditure is more significant. Finally, the larger the project, (i.e., cost and scale are generally closely correlated), the more visible and hence susceptible the project probably will be to governmental and public pressure.

3) Project year.--The later the year in which project planning activity was most intensive, the greater will be the ecological incorporation embodied in the project planning process.

Time is a crucial ingredient in the process of innovation diffusion and adoption.[108] Over time one would expect broader diffusion and adoption of the environmentally-

oriented project planning concept. The more recent the project, the more likely it is that the home and host societies are further along in the environmental protection "issue-attention cycle,"[109] that the issue has been politicized (i.e., brought within the ambit of public institutions), and that the relevant environmental laws and regulations are more stringent. With the exponential rate of growth in the amount of environmental impact knowledge, planners of a more recent project would generally have access to a greater breadth, depth, and quality of planning information. Finally, the newer the industrial project, the more likely it is that the initiating firm is further along on the path of internal institutionalization of environmental management policy at the operating (i.e., project planning) level.[110]

4) Site location type.--The greater the extent to which the site location of the project is currently nonindustrial in character, the greater will be the ecological incorporation embodied in the project planning process.

Industrial project site locations differ widely with respect to how intensively the site area already is industrialized. A continuum of "nonindustrialization" can be envisaged, extending from 1) expansion at a site where the firm already has existing facilities, 2) a site in a governmentally prescribed heavy industrial zone, 3) a site in an area of neighboring existing industry, and 4) a site in

"virgin" territory with no previous existing industry. Public pressure and resistance to a new "pollution-intensive" project would generally be most intense when the proposed site location is in an area previously untouched by heavy industry. Less information would generally be available regarding existing environmental baseline conditions in a "virgin" site location, perhaps necessitating greater environmental research efforts. Planning permission "red-tape" and governmental examination of project plans would tend to be greater when a currently nonindustrial site location is involved. The intensity of public pressure, lack of baseline information, and amount of public examination would tend to be lowest when the project involved an expansion at a current site.

5) Project ownership.--The greater the extent of ownership of the project by the firm doing the planning, the greater will be the ecological incorporation embodied in the project planning process.

Divided project ownership arrangements (commonly termed "joint ventures") have many associated advantages and disadvantages in the field of international business.[111] Our attention is narrowly focused on the potential influence of divided ownership at the project planning stage. The presence of active partners in project planning could result in a beneficial pooling of resources, information, and influence. It is perhaps more likely, however, that such

an arrangement might result in lower efficiency and effectiveness with regard to the incorporation of ecological concerns into the planning process. The potential dilution of planning control, loss of flexibility, and difficulties of communication could serve to hinder the process of ecological incorporation.[112] A joint partner arrangement would imply that decisions on project actions, expenditures for environmental impact research, etc., have to be made by the "committee" process. The shortcomings of "decision by committee" are well known.[113] If project partners were to possess widely differing views on the need for environmental protection, then the above potential problems would be accentuated. Finally, partners may be reluctant to share their "proprietary" environmental control technology and information with each other. In short, greater ownership is felt to be more conducive to effective ecological incorporation; communication systems are complete, control over planning activity is undiluted and proprietary resources can be fully applied.

c. The influence of organization

It is hypothesized that the extent of ecological incorporation is directly related to the organizational context of the project planning process. Eight variables have been selected for examination:

1) Environmental control objectives and top management commitment.--The greater the extent to which the corporation's objectives for environmentally responsible behavior are made formally explicit, expressed in leadership terms, applied globally and backed by frequent illustrations of top management support, the greater will be the ecological incorporation embodied in the project planning process.

Organizations typically pursue a multiple number of goals or objectives simultaneously.[114] It is assumed that corporate project planning is guided by numerous values, only one of which is profit maximization.[115] Firmly held objectives for environmentally-oriented behavior are necessary for a concerted project planning effort. If such objectives are only weakly held, the corporation's members will tend to be more subject to the many vagrant pressures, from within the firm and without, to disregard such factors.[116] Explicitly-communicated corporate goals for environmental protection serve to provide orientation by depicting the desired state of affairs which the firm is trying to realize. Aharoni found that: 1) the perceptions held by lower echelons of the factors important to higher echelons influences the way in which they plan a project, 2) the company's policies act as a restraint on the project planner's freedom of choice, and 3) that modifications are usually made in projects to ensure that they are in accord with existing corporate objectives and policies.[117] Top management commitment to socially responsible objectives such as environmental

protection is essential. As Carl A. Gerstacker, the Chairman of the Dow Chemical Company states:

> Social responsibility must be a firm, deep-seated belief of the management . . . Management must be consistent in its support of social responsibility. . . . Management commitment must be long term.[118]

2) Environmental control role assignment.--The greater the extent to which the corporation has assigned personnel to formal roles concerned with environmental control, the greater will be the ecological incorporation embodied in the project planning process.

The creation of specialized roles for environmental control within the organization serves to redistribute influence and give emphasis to different values.[119] Such creation usually implies the implementation of new networks of communication, liaison, participation, interaction and decision making. Aharoni views role assignment as a key leverage point influencing the project planning process: "definition of roles by itself creates forces leading the organization to operate in certain directions."[120] The innovation advantages of staff roles are well known: staff members are usually more technically and professionally oriented than line personnel and, because of their incentive structure, are strongly motivated to criticize the line's behavior and press for changes.[121] These specialized environmental control roles are typically externally oriented, and represent interface positions which may enable the firm to be more sensitive to external stimuli regarding issues

of environmental quality. The role assignment may also represent a valuable reservoir of expertise on environmental problems. Finally, as professional personnel are heavily influenced by ideas generated within their profession,[122] such an internal role assignment may serve to institutionalize the advocacy of ecological values and bring about a new set of internally-shared attitudes which are more sympathetic to ecological concerns.

3) Environmental control performance measurement.--The greater the extent to which corporate plant and managerial environmental control performance is measured and evaluated, the greater will be the ecological incorporation embodied in the project planning process.

The importance of performance measurement and evaluation systems for the successful implementation of corporate policies and programs is well documented.[123] These systems have been found to exert considerable influence in the processes of investment decision making,[124] organizational innovation,[125] and corporate social responsiveness.[126] In all of these processes the mechanism at work is that of achieving the support of middle-level managers:

> Middle managers concentrate their attention and skill on the accomplishment of performance objectives for which they know they are going to be held responsible by their superiors. They assess responsibility in terms of two familiar criteria. The first is what is measured, and the second is what is rewarded. The strongest performance occurs when the organization is perceived consistently to reward outstanding achievers along a measured activity vector.[127]

As project planning is done at the middle-management level, it is likely that what these planners do in regard to incorporating ecological considerations depends critically on the reinforcements they receive for pursuing particular objectives. It will also depend on the system of environmental control measures, rewards, and punishments that the planners believe will be applied to the plant and its management once the project is operational.

4) Environmental control research and technology programs.--The greater the extent to which the corporation has researched, developed, and commercialized environmental control technology and know-how relevant to the project, the greater will be the ecological incorporation embodied in the project planning process.

With greater internal environmental control research and technology efforts (with relevance to the specific project being investigated in this study) a firm could be expected to possess a greater reservoir of technically specialized expertise on problems of project environmental impact. It would also have available the environmental engineering procedures, equipment and analytical techniques which could be applied in the current project. A deep-seated internal commitment to environmental control research would most likely be conducive to a corporate viewpoint that is sympathetic to environmental values. With external commercialization of this effort, the firm would generally be able to spread its research and development costs over a

larger market. External requests could in turn stimulate additional internal efforts. A firm attempting to commercialize its environmental control know-how and technology would also tend to want to maintain or enhance its own "environmental image." This could involve thorough, innovative and well-publicized ecological incorporation efforts during project planning.

5) Environmental control external surveillance and interaction.--The greater the extent of external surveillance of, interaction with and internal dissemination of information about the actions and plans of governmental environmental agencies, industry environmental organizations and citizen environmental groups by the corporation, the greater will be the ecological incorporation embodied in the project planning process.

An organization that is explicitly aware of its interdependence with the external milieu on matters of ecological protection and engages in a wide interchange with a variety of "normative reference" groups can be viewed as an open system. Opportunistic surveillance of, and interaction with, the normative organization set would tend to better enable a firm to anticipate and act in advance on relevant trends.[128] Increased sensitivity to external affairs is expected when the firm's sensory apparatus is finely tuned to receive early signals of external change.[129] Both the rate and type of organizational innovation is a function of exposure of the organization to its external milieu.[130] Much of the external surveillance and interaction

is initiated by "boundary spanning" units of the organization which are also primary sources of innovative inputs.[131] Frequent interaction provides for possible short-term feedback on the satisfaction and intentions of external units, thereby making adaptive innovation by the organization more feasible. Flows of people and information between the firm and its external environment will expand its knowledge. The importance of information systems (i.e., internal organization and dissemination of knowledge) in shaping decision-making behavior is well established.[132]

6) Company profitability.--The greater the relative profitability of the corporation, the greater will be the ecological incorporation embodied in the project planning process.

Profitability can be viewed as an indicator of organizational wealth, success, and slack. Organizational wealth has been found to be among the strongest predictors of innovation in the sense of readiness to adopt new patterns of behavior.[133] Successful corporations are usually more innovative than unsuccessful ones.[134] High profitability is also a partial indicator of slack conditions within a firm.[135] Slack determines whether an organization can afford innovation. A firm will conduct certain types of nonprogrammed activity and allocate more resources to noneconomic goals when slack is present than when conditions of scarcity are faced.[136] Therefore, more ecological

incorporation may occur in project planning when the corpor- is enjoying conditions of high relative profitability.

7) Company size.--The larger the size of the corporation, the greater will be the ecological incorporation embodied in the project planning process.

Large size could represent a facilitator of ecological incorporation, as it has been shown that there is a direct relation between the size of a firm and the propensity to innovate.[137] Larger firms may be able to attract more specialized environmental science personnel, give more flexibility to these professionals in developing new programs of environmental planning, and provide more free time for work on innovative material.[138] Increasing size offers more opportunities to reap the benefits of greater specialization, and large firms may be better able to assemble the "critical mass" of environmental specialists needed for project planning.[139] The risks and costs of ecological incorporation may be more easily borne by large firms. They may have better access to established and low cost sources of information and may have greater exposure to external change. Finally, larger firms may be more visible and hence more susceptible to public and governmental pressures for environmental protection.

8) Company investment intensiveness.--The larger the relative size of the corporation's current capital expenditure program, the greater will be the ecological incorporation embodied in the project planning process.

Firms with sizable and continuing current capital expenditure programs (i.e., many new projects being currently executed) are likely to have the greatest need for procedures and techniques of ecological incorporation in project planning. These firms will generally have the greatest amount of interaction with external public and governmental environmental organizations with regard to project planning experience. With more projects being planned under the new "environmental protection imperative" they will be confronted with more situations in which methods of ecological incorporation are needed.[140] Increasing levels of new investment intensity would enable the firm to enjoy economies of scale in the assembly of skills and resources needed for environmentally-oriented project planning. The costs of investments in specialized staff personnel, new control technologies, better procedures of analysis, etc., could be spread over a wider number of new projects.

d. The influence of public policy

It is hypothesized that the extent of ecological incorporation is directly related to the public policy context of the firm and the given project being planned. Five variables have been selected for examination:

1) Home country environmental policy character.--The more comprehensive the governmental administrative machinery for dealing with issues of environmental protection, the greater the public, interest group, and media attention to these issues, and the earlier the timing of governmental action and public attention in the home counry of the corporation, the greater will be the ecological incorporation embodied in the project planning process.

Organizational innovation is more likely when the social environment to which an organization (and its project planning members) belongs has norms that favor change than when it does not have such norms.[141] In addition, organizations which must adapt to a wide range of pressures will differ in their behavior from those which face a narrower range of pressures.[142] Project planning and approving executives are carriers of societal values and their behavior may tend to mirror the ideals and values of the home society to which they belong.[143] In societies further along in the environmental protection "issue-attention cycle" (i.e., interest group activity has been especially strong, the issues have been more dramatized by media attention, and the social movement has been more politicized), the process of corporate institutionalization of the policy issue could be expected to be more advanced.[144] As most innovation in an organization appears to result from borrowing rather than invention,[145] one would expect a firm that has experienced more exposure to societal ideas of advanced

preventive environmental planning to have adopted and implemented more of these ideas in its internal planning.

2) Host country environmental policy character.-- The more comprehensive the governmental administrative machinery for dealing with issues of environmental protection, the greater the public, interest group, and media attention to these issues, and the earlier the timing of governmental action and public attention in the host country of the corporation's project, the greater will be the ecological incorporation embodied in the project planning process.

Whereas the influence of home country environmental policy may be indirect and implicit, the influence of host country environmental policy is probably more direct and explicit. Cultural settings differ in the relative number of, and intensity of, stimuli evocative of ecological incorporation behavior. With the influence of home country environmental policy held constant, one would expect corporate project planning behavior to reflect the structure of compliance incentives operative within the host country of the project.[146] More project planning attention and resources would thus tend to be devoted to issues of environmental impact by a corporation when its project is destined for a country where the level of public attention is high, governmental machinery comprehensive, and concern for the issues has been evident for a longer period of time.

3) Public project examination.--The greater the extent to which prior discharge permissions, planning approvals, statements of environmental impact, and public interest hearings are required for the project, the greater will be the ecological incorporation embodied in the project planning process.

The more a firm is required to make an advance disclosure of its project and environmental control plans, the more likely it is that the firm will attempt to pinpoint and consider in advance the potential environmental impact objections that might be raised. This would be especially so when adversary, evidentiary public interest hearings are mandatory and where the intervenors may inquire freely into any aspect of the proposed project. In exposing a proposed project to public scrutiny, the firm will usually be forced to explain the basis of its judgments. Special structural procedures for "airing the issues," such as advance statements of potential environmental impact, could be expected to especially contribute to a more careful and conscientious attention to environmental issues during the course of project planning.

4) Project associated public pressures.--The greater the intensity of governmental agency, citizen group, community and media resistance to the project, and to similar prior projects in the same locality, the greater will be the ecological incorporation in the project planning process.

If a firm anticipates that it will encounter stringent demands for environmental protection and/or vehement

opposition to the proposed project from "antagonistic" interests, it will generally take advance actions in an attempt to diffuse such pressures. It might, among other things, yield ground in advance and attempt to design the project with environmental considerations in mind. Such anticipatory ecological incorporation would be done in the hope that direct confrontations, negative press treatments, citizen lawsuits, citizen group dilatory tactics and consequent project delays, and even terminations might be avoided. Ecological incorporation behavior might also be induced by demands and resistance actually experienced. The greater the amount of environmental protection pressure exerted on the firm from the local social setting (after gaining awareness of the project), the more a firm may engage in late-stage ecological incorporation efforts.

5) Environmental conflict experience.--The greater the extent of prior external conflict experienced by the corporation on issues of environmental impact with publics and governmental bodies, the greater will be the ecological incorporation embodied in the project planning process.

Prior external conflict over environmental issues (e.g., project delays and terminations, forced plant closings, adverse publicity, and litigation) could be expected to create disequilibrium, dissatisfaction and a well perceived "performance gap" within the organization. Conflict is typically negatively valued by organizational members.

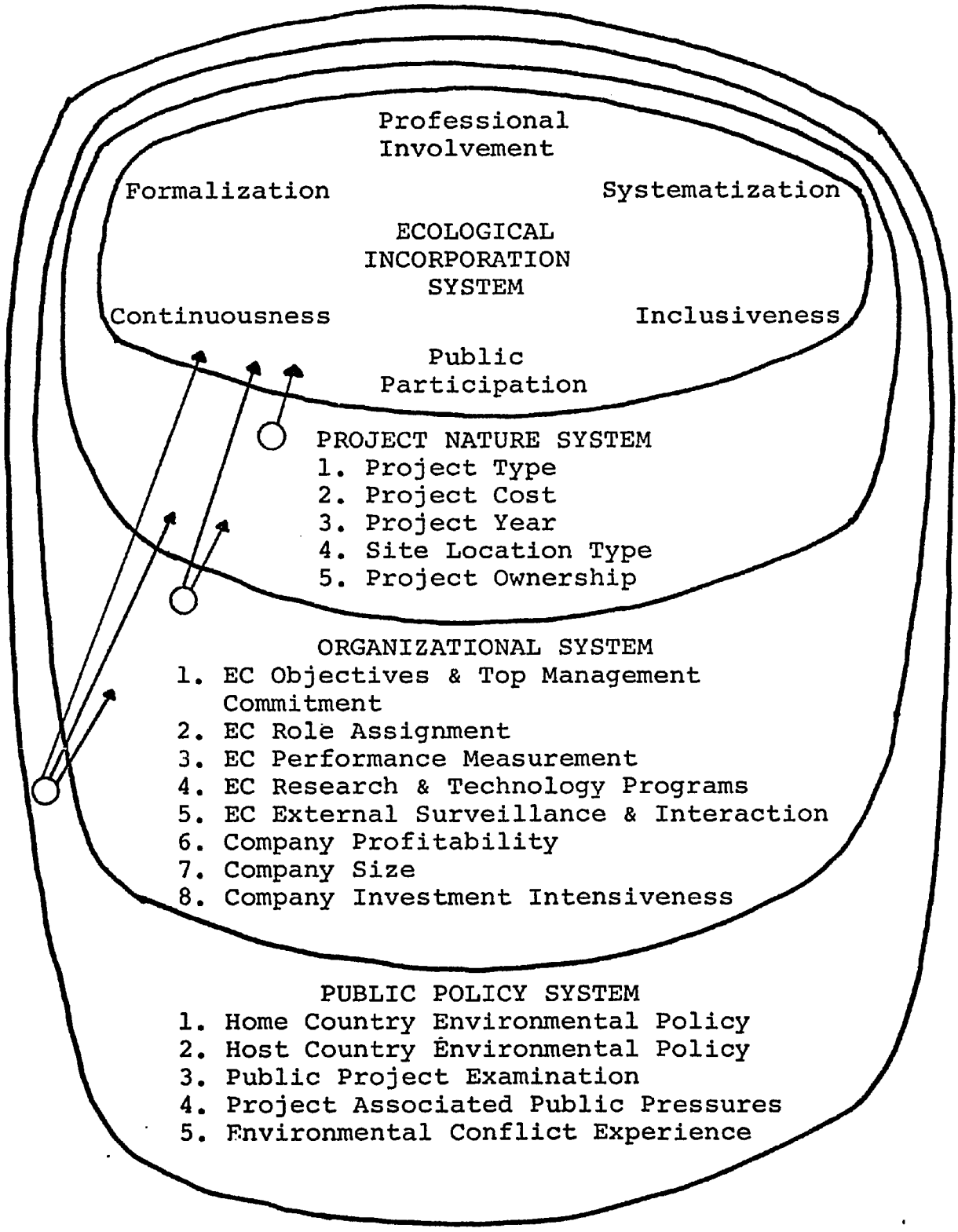
Such dissatisfaction would tend to induce a search for innovations that would reduce the performance gap and bring about more satisfactory external relations.[147] Conflict experience of crisis proportions would especially emphasize the "relative advantage" of a new idea such as ecological incorporation and hence affect its rate of adoption.[148] Major conflict episodes may be necessary for, and creatively utilized by top management to bring about, an internal institutionalization of environmental responsibility.[149] Thus prior trauma may be useful in sensitizing the firm to the need for ecological incorporation; necessity may indeed be the mother of invention!

D. SUMMARY OF CONCEPTUAL FRAMEWORK

Figure II.2 summarizes the conceptual framework of this study. Ecological incorporation (i.e., the effective integration of ecological considerations into the project planning process) is viewed as a multidimensional administrative innovation determined by the presence of ecologically-oriented inputs and means in six interrelated dimensions. This innovation is to be studied as a behavioral adaptation in response to different contextual conditions. As shown in Figure II.2, ecological incorporation behavior is embedded in three nested contextual influence systems: the project nature system, the organizational system, and the public policy system.

FIGURE II.2

SUMMARY OF CONCEPTUAL FRAMEWORK



The conceptual framework implies two essential research tasks. The first is the accurate description of both the dependent and independent variables. The research should increase our knowledge of the role of ecological factors in MNC project planning, the kinds of projects which are currently being executed by MNCs, the way MNCs have organized internally for environmental management, and the kinds of public policy measures which are being utilized by national and local governments to control industrial development. The second research task is that of exploratory explanation. Given the cross-sectional and small sample nature of the study, only relationships, not causal mechanisms, can be established. With considerable caution, however, an attempt is made to interpret salient relationships in terms of a preliminary explanatory model. The indirect and direct influence of each of the three contextual systems on the dependent variables of ecological incorporation is examined in detail. The channels of influence to be examined are indicated by the arrows in Figure II.2.

The five systems illustrated in Figure II.2 (e.g., ecological incorporation system, project nature system, organizational system, public policy system, and the system in total) coincide with five chapters of this study. In Chapter IV our focus is on the role of ecological considerations in the project planning process or the ecological incorporation system. In Chapters V, VI, and VII,

respectively, we examine the direct and indirect influence of project nature, organization and public policy. In Chapter VIII, the behavior of the total system is studied and preliminary conclusions are reached with regard to the "determinants" of environmentally-oriented project planning behavior.

FOOTNOTES

CHAPTER II

[1]For an extensive bibliography of this area see: Ralph O. Swalm, "Capital Expenditure Analysis--A Bibliography," The Engineering Economist, 13 (Winter, 1968), pp. 105-129. For capital budgeting theory see: Harold Bierman, Jr. and Seymour Smidt, The Capital Budgeting Decision: Economic Analysis and Financing of Investment Projects (New York: Macmillan, 1971), and Arthur Stonehill and Leonard Nathanson, "Capital Budgeting and the Multinational Corporation," California Management Review, 10 (Summer, 1968), pp. 39-54. For management science techniques see: Robert B. Stobaugh, Jr., "How to Analyze Foreign Investment Climates," Harvard Business Review, 47 (Sept.-Oct., 1969), pp. 100-108, and James C. Baker and Lawrence J. Beardsley, "Multinational Companies' Use of Risk Evaluation and Profit Measurement for Capital Budgeting Decisions," Journal of Business Finance, 5 (Spring, 1973), pp. 38-43. For the determinants of foreign investment see: Thomas N. Gladwin and Ian H. Giddy, "A Survey of Foreign Direct Investment Theory," Working Paper No. 86, (Division of Research, Graduate School of Business Administration, The University of Michigan, November 1973) and Guy V. G. Stevens, "The Multinational Firm and the Determinants of Investment," Discussion Paper No. 29 (Division of International Finance, Board of Governors of the Federal Reserve System, May 23, 1973).

[2]Joseph L. Bower, Managing the Resource Allocation Process: A Study of Corporate Planning and Investment (Boston: Division of Research, Graduate School of Business Administration, Harvard University, 1970). (Hereinafter referred to as Resource Allocation Process.)

[3]Yair Aharoni, The Foreign Investment Decision Process (Boston: Division of Research, Graduate School of Business Administration, Harvard University, 1970). (Hereinafter referred to as Foreign Investment.)

[4]Herbert A. Simon, The New Science of Management Decision (New York: Harper and Row, 1960), pp. 5-6.

[5]As will be reviewed later, "project definition" represents one of the major subprocesses of the overall project planning process. The concept is taken from Bower, Resource Allocation Process, pp. 52-57.

[6]For a view of planning as a design problem see: Hasan Ozbekhan, "The Emerging Methodology of Planning," Fields Within Fields, no. 10 (Winter, 1973-74), pp. 64-80.

[7]Aharoni, Foreign Investment, p. 35.

[8]See: Henry Mintzberg, Duru Ransinghani and André Théoret, "The Structure of 'Unstructured' Decision Processes," Working Paper (Montreal: Faculty of Management, McGill University, September 1973).

[9]Bower, Resource Allocation Process, pp. 67-68.

[10]Ibid., pp. 68-71.

[11]Ibid., p. 320.

[12]Aharoni, Foreign Investment, Chapter 2: "An Overview of the Decision Process," pp. 14-48.

[13]Ibid., p. 79.

[14]Ibid., p. 149.

[15]This concept can be traced to the Subcommittee on Science, Research and Development, Committee on Science and Astronautics of the House of Representatives. The idea was first introduced in 1967 and eventually led to the formal establishment of an Office of Technology Assessment in the U.S. Congress in 1972. The need for, and conceptual development of, technology assessment has been extensively documented. See: National Academy of Sciences, Technology: Processes of Assessment and Choice, Report to the Committee on Science and Astronautics, U.S. House of Representatives, (Wash., D. C.: U.S. Govt. Printing Office, July 1969); National Academy of Engineering, Committee on Public Engineering Policy, A Study of Technology Assessment, Report to the Committee on Science and Technology, U.S. House of Representatives, (Wash. D. C.: U.S. Govt. Printing Office, July 1969); Raphael G. Kasper, (ed.), Technology Assessment: Understanding the Social Consequences of Technological Applications, (New York: Praeger, 1972).

[16]Joseph F. Coates, "Technology Assessment: The Benefits ...The Costs...The Consequences," The Futurist, 5 (December, 1971), p. 225.

[17]For perhaps the most thorough survey of the concept of technology assessment see: François Hetman, Society and the Assessment of Technology (Paris: Organization for Economic Cooperation and Development, 1973), Chapter 2.

[18]Nina Laserson, "Technology Assessment at the Threshold," Innovation, No. 27 (January, 1972), p. 16.

[19]The National Environmental Policy Act of 1969, Public Law 91-190, January 1, 1970 (42 U.S.C. 4321-4347).

[20]N.E.P.A., Section 102(2)(C)

[21]Ibid.

[22]Ibid.

[23]See: Water Resources Research Institute, How Effective Are Environmental Impact Statements? (papers from a seminar conducted by Water Resources Research Institute, Oregon State University, Spring Quarter 1973), (Springfield, Va.: National Technical Information Service, Report No.: PB-230 702, July, 1973).

[24]See: Richard N. L. Andrews, "Environmental Policy and Administrative Change: The National Environmental Policy Act of 1969, 1970-1971," (unpublished Ph.D. dissertation, The University of North Carolina at Chapel Hill, 1972); Frederick R. Anderson, NEPA in the Courts: A Legal Analysis of the National Environmental Policy Act, (Baltimore: The Johns Hopkins University Press for Resources for the Future, Inc., 1973); Roger C. Cramton and Richard K. Berg, "On Leading a Horse to Water: NEPA and the Federal Bureaucracy," Michigan Law Review, 71 (Jan., 1973), pp. 511-536.

[25]For a survey of agency procedures see: Subcommittee on Fisheries and Wildlife Conservation of the Committee on Merchant Marine and Fisheries, House of Representatives, 92nd Congress, Administration of the National Environmental Policy Act - 1972, Appendix, Serial 92-95, (Wash., D. C.: U.S. Govt. Printing Office, 1972). For surveys of available methodologies see: Richard N. L. Andrews, "Approaches to Impact Assessment: Comparison and Critique," presented at the Short Course on Impact Assessment in Water Resource Planning: Amherst, Mass., May 11, 1973, Ann Arbor, Michigan, June 9, 1973, and Eastsound, Washington, June 15, 1973); and Leonard Ortolano, Analyzing the Environmental Impacts of Water Resources (a report submitted to the U.S. Army Engineers Institute for Water Resources), I.W.R. Report 73-3, March 1973.

[26]David A. Aggerholm, "Developing Systems for Impact Analysis," (Introduction and Closing Remarks to Panel Session at Symposium, "The National Environmental Policy Act--At the Interface of Law and Science," Annual Meeting, American Association for the Advancement of Science, Washington, D. C., December 28, 1972), p. 5.

[27]Richard N. L. Andrews, "Conceptual Foundations for Environmental Impact Assessment," (unpublished paper, The University of Michigan, 1973), p. 9.

[28]See: Richard N. L. Andrews, "A Philosophy of Environmental Impact Assessment," Journal of Soil and Water Conservation, 28 (Sept.-Oct., 1973), pp. 197-203; and Leonard Ortolano, "Impact Assessment in the Water Resources Planning Process," (paper presented at the Short Course on Impact Assessment in Water Resource Planning, Amherst, Mass.; Ann Arbor, Mich.; Eastsound, Wash., May and June 1973).

[29]Andrews, "Approaches to Impact Assessment," pp. 2-5.

[30]Ortolano, "Impact Assessment in the Water Resources Planning Process," p. 21.

[31]Section 102(2)(A) of the National Environmental Policy Act of 1969 (Public Law 91-190), states that "all agencies of the Federal Government shall utilize a systematic, interdisciplinary approach which will insure 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."

[32]See: Aggerholm, "Developing Systems for Impact Analysis," p. 7; and Evan Vlachos, "Sociological Considerations in Systemic Analysis," (paper presented at the Short Course on Impact Assessment in Water Resource Planning, Amherst, Mass.; Ann Arbor, Mich.; Eastsound, Wash.; May and June 1973).

[33]See: Andrews, "A Philosophy of Environmental Impact Assessment," p. 199; and Ortolano, "Impact Assessment in the Water Resources Planning Process," pp. 6-14.

[34]Andrews, "A Philosophy of Environmental Impact Assessment," pp. 199-200.

[35]For two review articles see: Andrews, "Approaches to Impact Assessment," and Thomas G. Dickert, "Methods for Environmental Impact Assessment: A Comparison," pp. 127-143, in Thomas G. Dickert with Katherine R. Domeny, eds.,

Environmental Impact Assessment: Guidelines and Commentary (Berkeley: University Extension, University of California, 1974).

[36]Office of Environmental Affairs, Environmental, Health and Human Ecological Consideration in Economic Development Projects (Washington, D. C.: Office of Environmental Affairs, World Bank, 1973).

[37]Luna B. Leopold, Frank E. Clarke, Bruce B. Hanshaw and James R. Balsley, A Procedure for Evaluating Environmental Impact (Washington, D. C.: U.S. Geological Survey, Circular 645, 1971) and P. Bereano, J. Callen, W. Kellner, G. Olson, and B. Wengrenroth, A Proposed Technology for Assessing Alternative Technologies (Ithaca, N. Y.: Cornell University, December 1972).

[38]Theodore J. Wirth and Associates, Report and Draft Environmental Impact Statement for the Lake Tahoe Plan and Effectuating Ordinances, (South Lake Tahoe, Calif.: Tahoe Regional Planning Commission, 1972).

[39]Robert R. Nathans, Associates, U.S. Deepwater Port Study, Vol. IV: The Environmental and Ecological Aspects of Deepwater Ports, U.S. Army Engineers Institute for Water Resources), I.W.R. Report 72-8, (1972).

[40]Jens C. Sorenson, A Framework for Identification and Control of Resource Degradation and Conflict in the Multiple Use of the Coastal Zone (Berkeley: The University of California, Department of Landscape Architecture, 1971).

[41]Walter Isard, et al., Ecologic-Economic Analysis for Regional Development: Some Initial Explorations with Particular Reference to Recreational Resource Use and Environmental Planning (New York: Free Press, 1972).

[42]Ian L. McHarg, Design with Nature (Garden City, N.Y.: Natural History Press, 1969).

[43]Julius Kane, Ilan Vertinsky and William Thomson, "KSIM: A Methodology for Interactive Resource Policy Simulation," Water Resources Journal, 9 (Feb., 1973), pp. 65-79.

[44]Norbert Dee, Janet K. Baker, Neil L. Drobny, Kenneth M. Duke and David C. Fahringer, Final Report on Environmental Evaluation System for Water Resources Planning, Report to Bureau of Reclamation, U.S. Department of the Interior (Columbus, Ohio: Battelle Memorial Institute, Jan. 31, 1972).

[45]For definitions of ecology, ecosystem and ecosphere see: Paul Ehrlich, Anne H. Ehrlich and John P. Holdren, Human Ecology: Problems and Solutions (San Francisco: W. H. Freeman, 1973), pp. 6-7.

[46]This is usually the main reason for using multiple indicators in survey research. See: Richard F. Curtis and Elton F. Jackson, "Multiple Indicators in Survey Research." The American Journal of Sociology, 68 (Sept., 1962), p. 195.

[47]N.E.P.A. calls upon the agencies to utilize an interdisciplinary approach: "To approach environmental problems through the integrated use of natural and social sciences and the 'environmental design' arts." N.E.P.A. Section 102(A).

[48]Downs has found that the degree of search will be extended and the diversity of alternatives considered will be increased when 1) many people are brought into decision-making, 2) those involved have a wide variety of views and interests, and 3) a higher proportion of analytically skillful or highly trained persons are participating. See: Anthony Downs, Inside Bureaucracy (Boston: Little, Brown and Co., 1967), p. 185.

[49]For reviews of the systematic methods and procedures which can be employed in environmental impact assessment and technology assessment see: Andrews, "Approaches to Impact Assessment;" Kan Chen and George J. Zissis, "Philosophical and Methodological Approaches to Technology Assessment," (Environmental Research Institute of Michigan, The University of Michigan, June 1973); Dickert, "Methods for Environmental Impact Assessment," and Hetman, Society and the Assessment of Technology, Chapter 3.

[50]". . . the impact of investments on the human environment requires a systematic and integrated view of the project which links them to material flows within production processes and throughout the economy and society," World Bank Office of Environmental Affairs, Environmental, Health, and Human Ecological Considerations, Chapter 9, p. 19. For a similar viewpoint see Andrews, "A Philosophy of Environmental Impact Assessment," pp. 199-200.

[51]Andrews, "A Philosophy of Environmental Impact Assessment," p. 199, and Ortolano, "Impact Assessment in the Water Resources Planning Process," pp. 6-14.

[52]Martin H. Krieger, "Social Equity and Environmental Quality," p. 71 in Thomas G. Dickert with Katherine R. Domeny, eds., Environmental Impact Assessment. (Note in parentheses added by author.)

[53]When a wider variety of views and interests are brought into the planning process the degree of search will be extended and the diversity of alternatives considered will be increased. Downs, Inside Bureaucracy, p. 185.

[54]". . . environmental impact assessment must take place throughout the course of planning, as an integral element of the planning process, if it is to improve or even affect the decisions that are made. The process of planning is shot through from the start to finish with judgments, intuitive predictions, and assumptions about the impacts of alternative actions." Richard N. L. Andrews, "Impact Statements and Impact Assessment," (keynote address presented to the Engineering Foundation Conference on "Preparation of Environmental Impact Statements," Henniker, New Hampshire, July 29, 1973), p. 16.

[55]D. W. Fischer and G. R. Francis, "Water Resource Development and Environment: An Approach to Impact Analysis," International Journal of Environmental Studies, 5 (Dec., 1973), p. 300.

[56]This is inferred by analogy from an examination of the response of U.S. federal agencies to specific "action-forcing" provisions in N.E.P.A. Formalization of the requirements has produced a dramatic change in the manner and substance of decision making in agencies such as the Army Corps of Engineers, the Department of the Interior, the Atomic Energy Commission, etc. See: Cramton and Berg, "On Leading a Horse to Water," p. 512.

[57]For a discussion of the mathematical properties and permissible statistics of ordinal scales vis-a-vis nominal, interval and ratio scales see: S. S. Stevens, "Mathematics, Measurement and Psychophysics," in S. S. Stevens, ed., Handbook of Experimental Psychology (New York: John Wiley, 1962).

[58]The phrase "external milieu" is defined in this section as the aggregate of all the external conditions and influences affecting the life and development of the organization and should not be confused with the term "environment," which in this study is confined to the physical, natural, and biological aspects of the surrounding milieu.

[59]Koya Azumi and Jerald Hage, Organizational Systems: A Text-Reader in the Sociology of Organizations (Lexington, Mass.: D. C. Heath and Company, 1972), p. 27.

[60]See A. K. Rice, The Enterprise and its Environment (London: Tavistock, 1963); James D. Thompson, Organizations in Action (New York: McGraw Hill, 1967); and Daniel Katz and Robert L. Kahn, The Social Psychology of Organizations (New York: John Wiley and Sons, 1966).

[61]Katz and Kahn, The Social Psychology of Organizations, pp. 448-449.

[62]S. E. Emery and E. L. Trist, "The Causal Textures of Organizational Environments," Human Relations, 18 (Feb., 1965), pp. 21-31.

[63]Shirley Terreberry, "The Evolution of Organizational Environments," Administrative Science Quarterly, 12 (March, 1968), pp. 590-613.

[64]Walter F. Buckley, Sociology and Modern Systems Theory (Englewood Cliffs, N. J.: Prentice-Hall, 1967), pp. 206-207.

[65]John Child, "Organizational Structure, Environment and Performance: The Role of Strategic Choice," Sociology, 6 (Jan., 1972), pp. 3-4.

[66]William R. Dill, "Environment as an Influence on Managerial Autonomy," Administrative Science Quarterly, 2 (March,,1958), pp. 409-443.

[67]Richard L. Simpson and William H. Gulley, "Goals, Environmental Pressures and Organizational Characteristics," American Sociological Review, 27 (June, 1960), pp. 344-351.

[68]Paul R. Lawrence and Jay W. Lorsch, Organization and Environment: Managing Differentiation and Integration (Boston: Harvard University, Graduate School of Business Administration, Division of Research, 1967).

[69]See: Michel Crozier, "Cultural Determinants of Organizational Behavior," in Anant R. Negandhi, ed., Environmental Settings in Organizational Functioning (Kent, Ohio: The Comparative Administration Research Institute of the Center for Business and Economic Research, Kent State University, 1970), pp. 49-58; Michel Crozier, The Bureaucratic Phenomenon (London: Tavistock, 1964); Frederick H. Harbison and Charles A. Myers, Management in the Industrial World:

An International Analysis (New York: McGraw Hill, 1959). For further research on the influence of culture see the extensive bibliography in: Raghu Nath, "A Methodological Review of Cross-Cultural Management Research," International Social Science Journal, 20 (No. 1, 1968), pp. 35-62.

[70]Robert B. Duncan, "Characteristics of Organizational Environments and Perceived Environmental Uncertainty," Administrative Science Quarterly, 17 (Sept., 1972), pp. 313-327.

[71]For an excellent recent book of readings on this topic see: Matthew Tuite, Roger Chisholm, and Michael Radnor, eds., Interorganizational Decision Making (Chicago: Aldine Publishers, 1972).

[72]William M. Evan, "The Organization-Set: Toward a Theory of Interorganizational Relations," in James D. Thompson, ed., Approaches to Organizational Design, (Pittsburgh: University of Pittsburgh Press, 1966), pp. 175-191.

[73]Roland L. Warren, "The Interorganizational Field as a Focus for Investigation," Administrative Science Quarterly, 12 (Dec., 1967), pp. 396-419; and Sol Levine and Paul E. White, "Exchange as a Conceptual Framework for the Study of Interorganizational Relationships," Administrative Science Quarterly, 5 (March, 1961), pp. 583-601.

[74]Michael Aiken and Jerald Hage, "Organizational Interdependence and Intra-organizational Structure," American Sociological Review, 33 (Dec., 1968), pp. 912-931.

[75]James D. Thompson, "Organizations and Output Transactions," American Journal of Sociology, 68 (Nov., 1962), pp. 309-324.

[76]Robert W. Ackerman, "How Companies Respond to Social Demands," Harvard Business Review, 51 (July-August, 1973), pp. 88-98.

[77]Ibid., pp. 90-91.

[78]Lawrence B. Mohr, "Determinants of Innovation in Organizations," American Political Science Review, 64 (March, 1969), p. 112.

[79]James Q. Wilson, "Innovation in Organizations: Notes Toward a Theory," in James D. Thompson, ed., Approaches to Organizational Design, p. 196.

[80]For the most thorough review of this diverse body of research see: Everett M. Rogers and F. Floyd Shoemaker, Communication of Innovations: A Cross-Cultural Approach, 2nd ed., (New York: The Free Press, 1971).

[81]See: Gerald Zaltman, Robert Duncan and Jonny Holbek, Innovation and Organizations (New York: John Wiley and Sons, 1973) and James M. Utterback, "Innovation in Industry and the Diffusion of Technology," Science, 183 (Feb. 15, 1974), pp. 620-626.

[82]The "performance gap" theory of organizational innovation is generally attributed to Anthony Downs. See: Downs, Inside Bureaucracy, pp. 169-170.

[83]For a discussion of "problemistic search" see: Richard M. Cyert and James G. March, A Behavioral Theory of the Firm (Englewood Cliffs, N. J.: Prentice Hall, 1963), p. 120. For a general discussion of the process of search behavior within an organization see: James G. March and Herbert A. Simon, Organizations (New York: John Wiley & Sons, 1958), pp. 173-174, 180.

[84]Rogers and Shoemaker, Communication of Innovations, p. 139.

[85]Downs, Inside Bureaucracy, p. 195.

[86]Martin M. Rosner, "Economic Determinants of Organizational Innovation," Administrative Science Quarterly, 12 (March, 1968), pp. 614-625.

[87]Roger Emile Miller, Innovation, Organization and Environment (Sherbrooke: Institut de Recherche et de Perfectionnement en Administration, Universite de Sherbrooke, 1971).

[88]Zaltman, et al., Innovations and Organizations, p. 110; Burns and Stalker relied heavily on this variable in their study of management innovation. See: Tom Burns and G. M. Stalker, The Management of Innovation (London, Tavistock, 1961).

[89]Mohr, "Determinants of Innovation in Organizations," p. 112; also see Everett M. Rogers, Diffusion of Innovations (New York: The Free Press, 1962), pp. 59-75.

[90]Wilson, "Innovation in Organizations," p. 210.

[91]For one of the most comprehensive studies see: Victor A. Thompson, Bureaucracy and Innovation (University, Alabama: University of Alabama Press, 1969).

[92]Selwyn W. Becker and Thomas L. Whisler, "The Innovative Organization: A Selective Review of Current Theory and Research," The Journal of Business, 40 (Oct., 1967), pp. 462-469.

[93]Jerald Hage and Michael Aiken, Social Change in Complex Organizations (New York: Random House, 1970), pp. 32-52.

[94]For a critique of this method see: James N. Rosenau, "The Premises and Promises of Decision-Making Analysis," in James C. Charlesworth, ed., Contemporary Political Analysis (New York: The Free Press, 1967), pp. 189-211. For a collection of readings in this area see: Mattei Dogan and Stein Rokkan, eds., Quantitative Ecological Analysis in the Social Sciences (Cambridge, Mass.: The MIT Press, 1969).

[95]Richard C. Snyder, H. W. Bruck, and Burton Sapin, Decision-Making as an Approach to the Study of International Politics (Princeton: Foreign Policy Analysis Project, Organizational Behavior Section, Princeton University, June, 1954).

[96]Raymond A. Bauer, Ithiel de Sola Pool, and Lewis A. Dexter, American Business and Public Policy (New York: Atherton Press, 1963).

[97]D. S. Pugh, et al., "The Context of Organization Structures," Administrative Science Quarterly, 14 (March, 1969), pp. 91-114.

[98]See: R. H. Hall, J. E. Haas, and J. N. Johnson, "Organizational Size, Complexity and Formalization," American Sociological Review, 32 (Dec. , 1967), pp. 903-912; John Child, "Predicting and Understanding Organization Structure," Administrative Science Quarterly, 18 (June, 1973), pp. 168-185; John Child and Roger Mansfield, "Technology, Size and Organization Structure," Sociology, 6 (Sept., 1972), pp. 369-394; Joan Woodward, Industrial Organization: Theory and Practice (London: Oxford University Press, 1965); E. Harvey, "Technology and the Structure of Organization," American Sociological Review, 33 (April, 1968), pp. 247-259.

[99]Aharoni, Foreign Investment, p. 291.

[100]Ibid., pp. 310-314.

[101]Bower, Resource Allocation Process, pp. 71-73.

[102]Ibid., p. 73.

[103]For a review of this issue see: Garlie A. Forehand and B. von Haller Gilmer, "Environmental Variation in Studies of Organizational Behavior," Psychological Bulletin, 62 (Dec., 1964), pp. 361-382.

[104]Mohr, "Determinants of Innovation in Organization," p. 111.

[105]For a discussion of this complexity see: Blair T. Bower and Walter O. Spofford, Jr., "Environmental Quality Management," Natural Resources Journal, 10 (Oct., 1970), pp. 655-667.

[106]Zwick has found that projects are modified to make them acceptable to top management groups by reducing exposure to risk and uncertainty. See: Jack Zwick, "Aspects of the Foreign Capital Rationing Procedures of Certain American Manufacturing Corporations," (unpublished D. B. A. dissertation, Harvard University Graduate School of Business Administration, August 1964).

[107]This is suggested in: Guy V. G. Stevens, "The Multinational Firm and the Determinants of Investment," Discussion Paper No. 29 (Division of International Finance, Board of Governors of the Federal Reserve System, May 23, 1973), p. 25.

[108]Katz, Levin and Hamilton have characterized the process of diffusion as the 1) acceptance, 2) over time, 3) of some specific item --an idea or practice-- 4) by individuals, groups or other adopting units, linked 5) to specific channels of communication, 6) to a social structure, and 7) to a given system of values, or culture. Time is viewed as a key component. See: Elihu Katz, Martin L. Levin, and Herbert Hamilton, "Traditions of Research on the Diffusion of Innovation," American Sociological Review, 28 (April, 1963), pp. 237-252. (Emphasis added.)

[109]Anthony Downs, "Up and Down with Ecology--The 'Issue-Attention Cycle,'" The Public Interest, No. 28 (Summer, 1972), pp. 38-50.

[110]Ackerman, "How Companies Respond to Social Demands," p. 92.

[111]For an analytical examination of the costs and benefits of joint ventures to MNCs see: John M. Stopford and Louis T. Wells, Jr., Managing the Multinational Enterprise: Organization of the Firm and Ownership of the Subsidiaries (New York: Bani Books, 1972), especially part II. Also see: Business International, "Pros and Cons of Joint Ventures Abroad," Management Monographs, No. 19 (New York: 1964) and Wolfgang G. Friedmann and George Kalmanoff, eds., Joint International Business Ventures (New York: Columbia University Press, 1961).

[112]The difficulties of communicating effectively in joint ventures have been pointed out by many observers of international business. For one point of view see: John Fayerweather, "The Internationalization of Business," The Annals, 403 (Sept., 1972), pp. 4-9.

[113]Walter J. Hickel, in discussing the loose consortium of the Trans Alaska Pipeline System (TAPS), provides us with a comment on the unwieldy "decision by committee" approach: "With seven Indians and no chief it was difficult to get anything done, particularly as far as getting technical data was concerned. There was no single spokesman or executive who had the authority to say, 'Okay, this is what TAPS will do.' By the time all the principals could be telephoned in Texas, New York, California, and London, it could take weeks just to get an agreement on what color to paint the toilets in the construction camps." In Walter J. Hickel, Who Owns America (New York: Paperback Library, 1972), pp. 117-118.

[114]The multiple goals may be attended to sequentially, however. See: Herbert A. Simon, "On the Concept of Organizational Goal," Administrative Science Quarterly, 9 (June, 1964), pp. 1-22.

[115]For evidence backing the validity of this assumption see: Ross Stagner, "Corporate Decision Making: An Empirical Study," pp. 119-134 in Gary A. Yukl and Kenneth N. Wexley, eds., Readings in Organizational and Industrial Psychology (New York: Oxford University Press, 1971).

[116]Firmly held goals or objectives represent a positive orienting resource to the organization. For this view see: Charles Perrow, Organizational Analysis: A Sociological View (Belmont, California: Wadsworth, 1970).

[117]Aharoni, Foreign Investment, pp. 143, 149, 309-310.

[118]Carl A. Gerstacker, "Creating a Management Environment for Socially Responsible Performance," in Melvin Anshen, ed., Managing the Socially Responsible Corporation (New York: Macmillan, 1974), pp. 41-58.

[119]Reorganization works by disrupting established lines of access and other regularities that keep organization members doing the old things in the old ways. For a discussion of this view see: H. A. Simon, D. W. Smithburg and V. A. Thompson, Public Administration (New York: Alfred A. Knopf, 1950), Chapter 7.

[120]Aharoni, Foreign Investment, p. 311.

[121]Downs, Inside Bureaucracy, pp. 154-155.

[122]Ibid., p. 203.

[123]For a summary discussion of this point see: Edmund P. Learned, C. Roland Christensen, Kenneth R. Andrews and William D. Guth, Business Policy: Text and Cases, Revised Edition (Homewood, Illinois: Richard D. Irwin, 1969), pp. 629-645.

[124]Bower, Resource Allocation Process.

[125]Wilson, "Innovation in Organizations."

[126]Ackerman, "How Companies Respond to Social Demands."

[127]Melvin Anshen, "The Socially Responsible Corporation: From Concept to Implementation," in Anshen, Managing the Socially Responsible Corporation, p. 11.

[128]For studies of how multinational corporations search and scan the external environment see: Francis Joseph Aguilar, Scanning the Business Environment (New York: Macmillan, 1967); Warren J. Keegan, "Scanning the International Business Environment: A Study of the Information Acquisition Process" (unpublished D. B. A. dissertation, Harvard University Graduate School of Business Administration, 1967); and John Snow Schwendiman, Strategic and Long-Range Planning for the Multinational Corporation (New York: Praeger, 1973).

[129]For a discussion of "sensitivity to the environment" see: Buckley, Sociology and Modern Systems Theory.

[130]March and Simon, Organizations, p. 188.

[131]This has been stressed by March and Simon, Organizations, pp. 165-166, 189, and R. L. Kahn, et al., Organizational Stress: Studies in Role Conflict and Ambiguity (New York: John Wiley and Sons, 1964), pp. 101-126.

[132]See: Harold Wilensky, Organizational Intelligence: Knowledge Policy in Government and Industry (New York: Basic Books, 1967).

[133]See: Jerald Hage and Michael Aiken, "Program Change and Organizational Properties: A Comparative Analysis," American Journal of Sociology, 72 (March, 1967), pp. 516-517; Edwin Mansfield, "The Speed of Response of Firms to New Techniques," Quarterly Journal of Economics, 77 (May, 1963), pp. 290-304; and Rogers, Diffusion of Innovation, pp. 40, 285-292.

[134]Thompson, Organizations in Action, p. 43.

[135]Slack is the difference between the payments required to maintain the organization and the resources obtained from the environment by the organization. For a full discussion of this concept see: Cyert and March, A Behavioral Theory, pp. 37, 278-279.

[136]Cyert and March, A Behavioral Theory, p. 279.

[137]Mohr, "Determinants of Innovation," p. 112.

[138]These potential advantages are suggested by: Leslie L. Roos, Jr., "Problems of Change," in Leslie L. Roos, Jr., ed., The Politics of Ecosuicide (New York: Holt, Rinehart and Winston, 1971), p. 270.

[139]Herbert Kaufman, The Limits of Organizational Change (University, Alabama: The University of Alabama Press, 1971), p. 105.

[140]In analogous terms, Klammer has found that capital intensive firms have the greatest need for, and do in fact utilize more heavily, sophisticated methods for capital budgeting (e.g., administrative procedures, risk analysis techniques, management science techniques, etc.). See: Thomas Klammer, "Empirical Evidence on the Adoption of Sophisticated Capital Budgeting Techniques," The Journal of Business, 45 (July, 1972), pp. 387-397.

[141]Rogers, Diffusion of Innovations, pp. 59-75.

[142]Simpson and Gulley, "Goals, Environmental Pressures and Organizational Characteristics," p. 344.

[143]Blau and Scott maintain that the geographical, cultural and community setting can influence organizational behavior markedly. See: Peter M. Blau and William R. Scott, Formal Organizations (San Francisco: Chandler, 1962).

[144]Bass and Eldridge have found corporate ecological decision-making behavior to be sensitive to cross-national effects. In a simulated exercise they found a manager's willingness to spend on ecology to vary by national origin of the manager. See: Bernard M. Bass and Larry D. Eldridge, "Accelerated Managers' Objectives in Twelve Countries," Industrial Relations, 12 (May, 1973), pp. 158-171.

[145]March and Simon, Organizations, p. 188.

[146]See: Stuart S. Nagel, "Incentives for Compliance with Environmental Law," American Behavioral Scientist, 17 (May-June, 1974), pp. 690-710.

[147]The "distress search" and "innovation in the face of adversity" ideas have been discussed in the literature. See: Kenneth E. Knight, "A Descriptive Model of the Intra-firm Innovation Process," The Journal of Business, 40 (Oct., 1967), pp. 478-496; Cyert and March, A Behavioral Theory, p. 278; March and Simon, Organizations, p. 115.

[148]Rogers and Shoemaker, Communication of Innovations, p. 139.

[149]Ackerman maintains: "The institutionalization of purpose may hinge on the creative use of trauma." Ackerman, "How Companies Respond to Social Demands," p. 94.

CHAPTER III

RESEARCH DESIGN OF THE STUDY

A. INTRODUCTION

The research design of this study is best described as cross-sectional, cross-national, comparative, exploratory, small sample, and interview-based. Project planning cases were taken from one general point in time, and variations in both the independent and dependent variables were explored. Interviews were conducted with multinational corporate executives in nine nations.[1] A comparative approach focusing on similarities and differences in the behavior of firms operating under diverse contextual conditions was the central feature of the design. The research was exploratory in the sense that new constructs were developed and applied, and many potentially relevant independent variables were scanned. Seventeen MNCs were interviewed and fifteen intensively examined project planning cases were employed in the formal data analysis. Finally, the study's data base was acquired principally through the use of personal interview method.

Creation of the research design was guided by the research objectives and conceptual framework, as outlined

in the previous chapter. However, it also necessarily involved considerations of availability of resources (i.e., cooperation of firms), and acknowledged constraints such as time and funds. The design is outlined below in four parts: data acquisition, data measurement, data analysis and interpretation, and limitations of the research design.

B. DATA ACQUISITION

1. Development of Interview Guide

The personal interview was selected as the most appropriate technique for carrying out this study. The kind of data needed to answer the research questions related to complex issues, proprietary information, and emotionally-laden topics. A flexible, focused personal interview approach, with full guarantees of anonymity, was deemed to represent the only viable means of reliably acquiring such delicate information.

A common interview guide was utilized throughout the field work (see Appendix A). It consists of open-ended questions concerning the firm's organization for environmental management and the characteristics of a recent project planning experience. The content of this guide was largely shaped by the data requirements set forth in the in the conceptual framework; each indicator of every variable in the study was translated into one or more questions.

2. Pretest of Interview Guide and Method

The focused interview approach and a preliminary version of the interview guide were pretested in a major U.S.-based MNC in December of 1973. Over a three-day period, fourteen interviews were conducted with nine different executives in the firm's environmental, financial, international, and project management departments. These pilot study interviews demonstrated the feasibility of researching the subject on a "project" focused basis, established the utility of conducting multiple interviews, and showed the necessity of flexible probing. Faults in the interview guide due to question form, order, and wording were detected, and subsequent revisions were made.

3. Sample Selection, Size and Composition

Sample selection was done on a stratified and convenience basis. Both cross-national and cross-industrial stratification was desired in order to explore the influence of different contextual conditions on project planning behavior. Exhibit III.1 shows that the seventeen MNCs included in the study were from six different home-base nations. Five were petroleum, eight were chemicals, and four were metals firms. The cooperation of these companies was achieved through the use of an advance request letter (see Appendix B), which was supplemented by contacts and sponsorship by faculty members at both The Graduate School

EXHIBIT III.1

SAMPLE AND PROJECT COMPOSITION

Home Country and Industry of Firms Interviewed

Country	Petroleum	Chemical	Metals
United States	3	4	1
Netherlands	1	2	1
United Kingdom	1	1	
Canada			1
Italy		1	
Sweden			1

Types of Projects Investigated

A. Chemical Projects

*Hydrofluoric Acids Plant
*Polyethylene Plant
*Polypropylene Plant
*Petrochemical Complex
Petrochemical Complex
Organic Acids Plant
Titanium Dioxide Plant

B. Metals Projects

*Alumina Extraction Plant
*Aluminum Smelter
*Aluminum Smelter Expansion
*Ferrosilicon Smelter
*Ore Mining Development
*Oxygen Steel Plant Expansion
*Steelworks Modernization & Expansion
Ferrochrome Plant
Aluminum Smelter Modernization

C. Gas and Petroleum Projects

*LNG Import Terminal & Gasification Facility
*Natural Gas Pipeline System
*Offshore Oil Complex
*Petroleum Refinery
Deepwater Oil Terminal

a) * = Intensively examined cases

of Business Administration at The University of Michigan and Centre d'Etudes Industrielles. Sample selection was limited by the requirement of conducting interviews in English, by the refusals of certain firms, most notably steel firms, to cooperate in the study, and by the costs of traveling.

The decision on a sample size of seventeen was reached on the basis of a subjective weighting of the benefits of increased precision in information obtained versus the costs of a large sample. The number of seventeen was not so small as to prevent the exploratory detection of contextual influences, yet not so big as to preclude the intensive investigation of individual projects.

Twenty-one distinct project planning experiences were investigated in the field research (a listing appears in Exhibit III.1). Of these twenty-one, fifteen were examined fully on all of the dimensions of ecological incorporation and were analyzed by means of formal quantitative techniques. Data was incomplete for the other six projects; they were therefore not included in the quantitative analysis. The fifteen projects which were formally analyzed originated in five parent countries (United States, Netherlands, Canada, Sweden, and United Kingdom) and were destined for ten host countres (United States, United Kingdom, Canada Germany, Sweden, Australia, France, Iceland, Ireland, and Mexico).

4. Interviewing of Respondents

Interviews were conducted in nine countries with a total of seventy-three corporate executives during the period April through July of 1974. The composition of these respondents by job title appears in Exhibit III.2. The partially structured, focused interview technique was employed throughout.[2] The interview guide provided the framework of topics to be covered, but the manner and sequence in which they were asked varied from interview to interview. Project experience questions were directed only to those executives who had been intimately involved with the project in question. Environmental management organization and policy questions were directed to both environmental staff and general management executives. Guarantees of personal and corporate anonymity were extended in every case. Most interviews were conducted with one executive alone, but a few were conducted in the form of a group discussion. The interviews averaged approximately two hours in duration, but ranged from one to six hours. All interviews were conducted in English. Extensive handwritten notes were taken during each interview and were later expanded that same day.

5. Cross-Check and Re-Check Interviews

Multiple interviews were conducted in each MNC. This was done in order to achieve coverage on the two kinds

EXHIBIT III.2

COMPOSITION OF RESPONDENTS BY POSITION TITLE

Environmental Management	Number Interviewed
Directors or Coordinators of Environmental Affairs	17
Technical or Engineering Environmental Coordinators	14
Managers of Environmental Public Relations	3
Safety Engineers	2
Medical Directors	2
Attorneys of Environmental Law	2
Project Management	
Project or Product Managers	9
Project Engineers	5
Corporate Planners	5
Process Design Managers	2
Senior General Management	
Executive Vice Presidents	6
Division Vice Presidents	4
Directors of Manufacturing or Planning	2
Total	73

of topics (i.e., project planning experience and environmental management organization), but also to internally cross-check the accounts of one respondent against those of another. In this way, rationalizations, distortions, memory failures, and discrepancies were easily spotted and were partly corrected for through further probing. An average of three executives were interviewed in each firm, but the actual number ranged from two to nine.

External cross-check interviews were conducted with personnel in a number of multinational engineering and construction contractors, environmental management consulting firms, and citizen-environmental groups. Even though the contractors and consulting firms naturally declined to discuss specific clients, extremely useful inputs on the roles of these kinds of organizations in the environmental aspects of MNC project planning were acquired. The interviews with citizen group representatives were limited to one country and did not prove to be very useful.

Selected executives were re-interviewed at various points during the data analysis and writing stages of the study. This usually took the form of written correspondance but also included a number of verbal interviews conducted at the International Environmental Management Seminar held at Centre d'Etudes Industrielles during January of 1975. These re-interviews were conducted for purposes of filling

in gaps in the data base, reconfirming key points, and "reality-testing" the preliminary results and conclusions of the study.

6. Use of Documentary and Secondary Materials

In addition to verbal accounts, considerable use was made of documentary and secondary materials in compiling the study's data base. Requests were made wherever possible to examine records, memoranda, and various documents bearing on the specific project or environmental management structure in question. In the project area, capital appropriations request forms, project proposals, and environmental impact studies were observed in over one-half of the firms. Environmental policy statements, descriptive brochures, organization charts, and position descriptions of environmental staff were gathered in almost all of the firms. This documentary material was useful in supplementing and/or confirming the data gathered in the interviews.

Annual reports and press releases from the firms were secondary materials that often contained relevant information on their environmental and investment activity. Published reports in the business, environmental, and legal press, both in the U. S. and in Western Europe, were also valuable sources of data regarding new project announcements, environmental control expenditures, conflicts with citizen groups, environmental lawsuits, and so on.

C. DATA MEASUREMENT

1. Data Reorganization

The interview, documentary, and secondary data pertaining to each indicator employed in the study for every firm and project was summarized on a separate page. For each indicator going into a dimension of ecological incorporation, for example, fifteen pages of separate observations were available. This data reorganization was undertaken so that the construction of category sets for each indicator and associated scoring of projects (or firms) on that indicator could be developed independently from all other findings. Independent data manipulation for each and every indicator was deemed to be essential in order to minimize the possible error of the "halo effect" (i.e., where the rater carries over a generalized impression of the object being measured from one ranking to the next or attempts to make the rankings consistent).

2. Categorization and Scoring of Data

Explicit category sets were constructed for all of the indicators in the study which were ordinal in character. These sets or groupings were inferred from the data on the basis of a clear conception of the range and distribution of the attribute among all the firms, combined with logically sound criteria for making division points. Each category set constructed was based on a single classification

(i.e., low to high), and made exhaustive and mutually exclusive. The content of each category was specified as accurately as possible through the use of a descriptive "anchor." These category sets with attached anchors appear in Appendix E. By using these sets, each with three explicitly-defined categories, the data for each firm or project was assigned to its appropriate grouping.

A common scoring system was then assigned to the ordinal categories of each indicator (i.e., low = 0, medium = .5, and high = 1) in order to facilitate the construction of composite indices and statistical analysis. As Labovitz has pointed out, only a small error results from assigning numbers (consistent with the rank order) to ordinal data and then treating the categories as if they conform to an interval scale.[3] Such an operation rarely alters the results of statistical analysis to an appreciable degree.[4] The advantages of doing so are: 1) more powerful, sensitive, better developed and interpretable statistics with known sampling error can be used, 2) more knowledge about the character of the data is retained, and 3) greater versatility in statistical manipulation is made possible.[5]

3. Index Construction

In order to reduce the "property space" of the analysis,[6] summated ratings or composite indices of multiple indicators were constructed. The utility of composite

indices is well established. Among other things, such indexes may 1) increase the number of categories in a variable, permitting a more detailed and precise analysis, 2) increase the empirical variability of the measures to be related, and/or 3) represent the underlying concept, even when none of the component indicators does so.[7] By combining items, the specificity of the individual items tends to average out, finer distinctions among the objects being measured can be made, and reliability tends to increase as measurement error is reduced.[8]

Multiple indicators were employed pervasively throughout the study, particularly for the dependent variable of ecological incorporation, but also for many of the independent variables. They were employed because no single, unambiguous, direct, operational definitions could be obtained or defended at this time for the variables in question.[9] For each variable the equally-weighted indicators were combined into a composite index. Item analysis procedures were undertaken to insure "internal consistency" of the items going into each index (i.e., to see whether each was approximately related to the same general attribute).[10] The correlation analysis described below was thus performed, for the most part, on composite indexes constructed from multiple indicators.

D. DATA ANALYSIS AND INTERPRETATION

1. Correlation Analysis

The main technique of data analysis employed was that of correlation. Use was made of the MIDAS computer programs for statistical data analysis at The University of Michigan for calculating both nonparametric and parametric correlations among the variables and associated significance tests. Greatest reliance was placed on the Kendall rank correlation coefficient (tau).[11] This nonparametric measure of association was deemed to be best suited for the analysis, because the sample was small and this measure did not require an assumption about the underlying distribution of the population studied.[12] Most of the analysis and interpretation was thus based on degrees of association between sets of rankings. Correlations were also computed using the Pearson product moment correlation coefficient (r). These were calculated on the raw composite index scores, not the rankings of these scores. Little difference was discovered between the resulting pearsonian correlation coefficients and the rank correlation coefficients calculated on the same sets of variables.

2. Partial Correlation Analysis

All the associations among the independent variables and the dependent variable were controlled statistically for those variables that were either possibly antecedent

to one or both of the variables being related, or that were possibly intervening between them. The introduction of controls was done in order to search for spurious associations and intervening variables. The analysis of "vanishing partials" facilitated the identification of possible direct and indirect linkages. Controlling for the influence of third variables also reduced the danger of misleading interpretation and increased the researcher's confidence that many of the zero-order correlations were genuine. Although partials can be applied to ordinal measures (e.g., partial tau), these are often difficult to interpret.[13] For this reason, along with the fact that existing computer programs for ordinal partial correlation were not available, the partial product moment measure was employed.

3. Cluster Analysis

Hierarchical clustering procedures were employed to determine similarities among the project planning processes in terms of their profiles on the dimensions of ecological incorporation.[14] The objective was to discover which planning processes "hung together" in terms of the level, shape, and dispersion of their scores on all of the dimensions considered jointly. This technique was employed in Chapter IV as a means of testing the reliability of the composite index as a good differentiating measure. Three clusters evolved from the empirical data, one of which

consisted of the low-scoring projects, another the medium-scoring, and the other the high-scoring projects (see Appendix C). The natural arrangement of the planning processes on all of the dimensions into homogenous groups was thus found to coincide with the total scores achieved on the composite index.

E. LIMITATIONS OF RESEARCH DESIGN

1. Many Variables and a Small Number of Cases

As is true in most applications of the comparative method, the major limitations in the design of this research related to the problems inherent in having many variables and a small number of cases.[15] The phenomenon of ecological incorporation was theorized to be a "variable-rich" phenomenon. It represented not one single administrative innovation, but a whole collection of interrelated innovations. Since little was known regarding the possible determinants of ecological incorporation and because multiple indicators were deemed to be necessary, the researcher found it necessary to scan a wide range of potential candidates for which adequate theory could be provided. The main consequence of this "too many variables" problem was that the analytical and interpretive techniques were somewhat overburdened. This was largely due to the small sample size which ruled out randomization, the implied large sampling errors, and the limitations on effective control operations.

2. Heavy Reliance on Subjective Judgment

The research entailed an extraordinarily heavy reliance on subjective judgment. The problems inherent in achieving the cooperation of MNCs on a delicate issue necessitated purposive, convenience sampling; sampling errors and biases could not be computed from such a sample. The absence of previously established and tested operational definitions for most of the constructs employed herein demanded a great deal of intuitive and deductive judgment in the creation of working indicators of the concepts purportedly being tested. The categorization and scoring of the data also had to rely heavily on subjective, but hopefully sufficiently explicated, judgment.

3. Incomplete Coverage of Variables and MNCs

The study focused on MNCs in three industries and two continents. The planning behavior of MNCs outside of these categories cannot be spoken for. Even though the study perhaps had "too many variables," it is possible that some very important ones were overlooked. Only variables relating to the organization were included; variables related to the innovativeness of individuals such as attitudes, competencies, professional orientations, opinion leadership, personalities, authority and power relations, and so forth, were not addressed. The possible influence

of confounding effects from these individual, or other outside, variables have not been systematically explored.

4. Inability to Establish Causality

Correlation does not imply causation. This study was not able to identify the "determinants" of ecological incorporation; only correlates which may or may not be real determinants were discovered. The cross-sectional nature of the study made it impossible to thoroughly reveal the temporal sequences involved among the variables. A limited attempt to gather some retrospective data, for example on conflict experience, was made, but longitudinal data on most variables was lacking. As will become evident, the finding of multicollinearity among the independent variables made it extremely difficult to isolate the separate effects of several independent variables operating simultaneously on ecological incorporation. As Blalock has pointed out, the existence of multicollinearity means that sampling errors may be large, controls for other independent variables may be highly misleading, and that it may be difficult to assess the relative contribution of the variables to the dependent variable.[16] This research also assumed linear relationships among the variables, additive effects of the independent variables, and one way causation. The possibilities that the relationships might be curvilinear, the effects

might be multiplicative, and reciprocal causation might be at work were not explored in any great detail.

5. Implications of Limitations

The limitations inherent in the design of this study imply that the results can only be considered suggestive. The study represents only a crude first attempt to understand the system of forces which lead MNCs to plan their projects in environmentally-oriented ways. Thus, the conclusions of the study must be interpreted and applied with a certain sense of caution.

FOOTNOTES

CHAPTER III

[1]For reviews of other cross-national management research studies see: Raghu Nath, "A Methodological Review of Cross-Cultural Management Research," International Social Science Journal, 20 (No. 1, 1968), pp. 35-62; Hans Schöllhammer, "Current Research on International and Comparative Management Issues," prepared for the 34th Annual Meeting of The Academy of Management, Seattle, Washington (August 18-21, 1974), 20 pp.; Hans Schöllhammer, "Strategies and Methodologies in International Business and Comparative Management Research," Management International Review, 13 (No. 6, 1973), pp. 17-41.

[2]See: R. K. Merton, M. Kiske, and P. L. Kendall, The Focused Interview (New York: The Free Press, 1956).

[3]Sanford Labovitz, "The Assignment of Numbers to Rank Order Categories," American Sociological Review, 35 (June, 1970), pp. 515-524.

[4]Boyle maintains that it will not usually be dangerous to assume an interval scale based on ordinal categories. See: Richard P. Boyle, "Path Analysis and Ordinal Data," American Journal of Sociology, 75 (Jan., 1970), pp. 461-480; Blalock suggests that "for exploratory purposes it may not be entirely unwise to make use of the rationale developed in connection with higher levels of measurement, even where actual measurement cannot be nearly so precise." See: Hubert M. Blalock, Jr., Causal Inferences in Nonexperimental Research (New York: W. W. Norton, 1972), p. 94; Labovitz has found powerful empirical evidence that only negligible error results from treating ordinal variables as if they conform to interval scales. See: Labovitz, "The Assignment of Numbers to Rank Order Categories;" and Sanford Labovitz, "Some Observations on Measurement and Statistics," Social Forces, 46 (Dec., 1967), pp. 151-160.

[5]Labovitz, "The Assignment of Numbers to Rank Order Categories," p. 515.

[6]Paul F. Lazarfeld and Allen H. Barton, "Qualitative Measurement in the Social Sciences: Classification, Typologies, and Indices," in Daniel Lerner and Harold D. Lasswell, eds., The Policy Sciences: Recent Developments in Scope and Method (Stanford: Stanford University Press, 1951), pp. 172-175.

[7]Richard F. Curtis and Elton F. Jackson, "Multiple Indicators in Survey Research," The American Journal of Sociology, 68 (Sept., 1962), p. 196.

[8]Jum C. Nunnally, Psychometric Theory (New York: McGraw-Hill, 1967), pp. 56-58.

[9]Curtis and Jackson, "Multiple Indicators in Survey Research," p. 195.

[10]For a review of these procedures see: Sellitz, et al., Research Methods in Social Relations, pp. 184-185.

[11]See: M. G. Kendall, Rank Correlation Methods (London: Griffin, 1955).

[12]For a discussion of when tau is most appropriate see: Sidney Siegel, Nonparametric Statistics for the Behavioral Sciences (New York: McGraw-Hill, 1956). Chapter 9.

[13]Labovitz, "The Assignment of Numbers to Rank Order Categories," p. 522.

[14]For discussions of these procedures see: Michael R. Anderberg, Cluster Analysis for Applications (New York: A Academic Press, 1973) and Stephen C. Johnson, "Hierarchical Clustering Schemes," Psycometrika, 32 (Sept., 1967), pp. 241-254.

[15]For a discussion of these "typical" problems see: Arend Lijphart, "Comparative Politics and the Comparative Method," The American Political Science Review, 65 (Sept., 1971), pp. 682-693.

[16]See: H. M. Blalock, "Correlated Independent Variables: The Problem of Multicollinearity," Social Forces, 42 (Dec., 1963), pp. 233-37 and H. M. Blalock, "Evaluating the Relative Importance of Variables," American Sociological Review, 26 (Dec., 1961), pp. 866-874.

CHAPTER IV

THE ROLE OF ECOLOGICAL CONSIDERATIONS IN MULTINATIONAL CORPORATE PROJECT PLANNING

A. INTRODUCTION

The central question addressed in this chapter is "in what manner, and to what extent, have ecological considerations been incorporated into the process of MNC project planning?" Stated in another way, is the current mode of project planning (i.e., inputs and means) environmentally-oriented?

With regard to the manner of incorporation, this study found that environmental professionals are frequently involved, that some use is made of systematic methods, that attention is focused primarily on issues of residuals discharge, that the inputs of affected citizens are rarely solicited, that environmental factors are usually considered only at a late stage of planning, and that formal rules on matters of environmental control spending have generally been built into the process.

This study discovered a great range of behavior among MNCs with regard to the extent of incorporation. Environmental factors have been incoporated quite exiguously

in some MNC project planning processes, moderately in others, and extensively in still others. In terms of modal behavior, however, it can be concluded that the practice of environmentally-oriented planning is still in its infancy. The bulk of planning behavior can be characterized as unecological, since careful thought and attention is not accorded to ecological impacts, values, and costs during the course of planning.

This chapter is concerned with the dependent variable of the study. Section B provides an in-depth qualitative description of the findings on incorporation behavior and is organized into a series of questions and answers under the six conceptualized dimensions of this behavior. Section C presents the categorization and scoring methods by which the raw data were converted into crude quantitative indices. Section D constructs a composite index of ecological incorporation and creates a rank order of the planning processes which extends from the least to the most amount of observed ecological incorporation. Finally, Section E briefly summarizes the content of the chapter.

B. FINDINGS ON THE ROLE OF ECOLOGICAL CONSIDERATIONS IN MNC PROJECT PLANNING

1. Professional Involvement

The dimension of professional involvement is concerned with the nature and range of environmentally-oriented participant skills and competencies utilized in the project

planning process. The involvement of experienced professionals, from a variety of disciplines, is necessary if a broad range of environmental concerns are to be covered and if the "mental blinders" on the conventional project planners are to be removed.

We generally found a relatively high level of environmentally-oriented professional involvement in MNC project planning. This involvement was most typically in-house, part-time, and environmental engineering in nature. Our findings on this dimension have been organized under four questions which follow.

a. Were in-house environmental professionals involved?

Internal corporate environmental staff personnel were found to be almost universally involved in the project planning processes, but with considerable variation in the kind and extent of involvement. The most common type of involvement was that of giving advice and counsel, usually on request from the project management team, but sometimes on a self-initiated basis. In the petrochemical complex project, for example, the project manager called upon the firm's environmental coordinator for a broad range of advice, including that of what should be studied in the ecological baseline survey and how the impact statement should be prepared. This coordinator was also requested to designate a qualified technical professional who could visit the site

location and assess the quality of the ongoing environmental research program.

Another fairly common form of involvement was that of assistance in making outside contacts. As one example, the project manager in the alumina project leaned heavily on the division's coordinator of environmental control to locate and line-up outside scientists who could present "expert" testimony during the project's public hearing. In the case of the liquified natural gas (LNG) import terminal, the corporate environmental director was requested to help evaluate and select the environmental consulting firm which was to prepare the formal impact assessment.

A much rarer form of involvement was that of full-time membership of an environmental advisor on the project planning team. This was observed only in the ore mining development, petroleum refinery, natural gas pipeline, off-shore oil complex, and steelworks modernization projects. In these cases the advisors were able to commission special studies as required, such as an environmental risk study of underwater oil storage in the case of the offshore oil complex, and a study on tailings pond reclamation in connection with the ore mine.

b. Were external environmental professionals involved?

External environmental professionals were involved to a significant extent in only one-half of the project

cases. In most instances they were brought in at a rather late stage of the planning process. The motives for utilizing externally-based consultants, as expressed by the respondents, were twofold: 1) to obtain necessary specialized expertise when it was lacking internally, and 2) to obtain an aura of credibility with the community and public authorities, by virtue of being able to submit investigations conducted by "unbiased" third parties.

External professionals were utilized in three different capacities. Most typically they conducted the "baseline" surveys of site location environmental conditions (e.g., hydrologic, atmospheric, biotic, sonic, and so on). In other cases they were employed for specialized technical evaluations. In the polypropylene project, for example, an outside firm was asked for its recommendations on the selection of either filtration or flocculation water pollution control equipment. In still other cases, they were brought in for expert testimony purposes. "Our engineer who recommended stack heights felt very uneasy about testifying on the impact of SO_2 on vegetation, so we had to locate an expert in this area and arrange for him to be with us at the hearings," commented one metals environmental coordinator.

The role of engineering and construction contractors in providing environmental expertise appeared to be, with a few exceptions, relatively minimal. A third of the

projects were using proprietary process technologies and in these cases the MNCs themselves were handling most pollution abatement issues in their own process design and engineering activities. A number of MNC respondents mentioned that the contractors generally did not possess the necessary environmental expertise and as a result "just did what we told them to do." In addition, many of the contractors have been reluctant to get significantly involved in the environmental side of project planning. This was explained by one U.S. engineering contractor executive:

> Our firm has steered away from involvement in such 'front end' activities as environmental impact studies for essentially two reasons: first, our skills lie in the realm of process engineering and project management and we just haven't attempted to staff up with environmental scientists; second, by virtue of our perceived self-interest in the project we suffer from the same credibility problem as do our clients."

c. Was the involvement of environmental expertise multidisciplinary?

The array of expert advice brought to bear in half the cases was almost solely engineering-oriented. The project planning teams in these cases were comprised of representatives only from the disciplines that have traditionally been involved and consulted in industrial project planning (e.g., chemical, mechanical, electrical, civil, metallurgical, soils testing, and geo-technical engineering).

The range of multidisciplinary environmental expertise brought to bear in the other projects, however, was

often impressive. Plans were made in the petrochemical complex project, for example, to have studies done by oceanographers, marine biologists, terrestrial botanists and biologists, meteorologists, and bacteriologists. In the offshore oil project, studies were conducted by ornithologists, wildlife ecologists, geographers, and landscape architects. Agronomists and livestock veternarians, among others, made significant contributions in the aluminum smelter project. Sociologists were involved in the natural gas pipeline.

The planning processes which had multidisciplinary expertise were typically the same ones in which external professionals had been significantly involved. This is so largely because most MNCs have not staffed themselves with professionals from the "new" environmental science disciplines. This was seen to be changing in a few firms, but a great deal of resistance to doing so appeared to be present. As was expressed by an executive of one of the largest petroleum firms in the world: "What would our company do with a full-time ecologist?"

Although multidisciplinary environmental expertise was found to be present in about one-half of the planning processes, this is not to say that the inputs from these diverse professionals were being handled in a truly "interdisciplinary" fashion. The studies conducted by these professionals were frequently commissioned on a separate

single-study contract basis. Coordinative mechanisms for giving integrated coherence to the diversified studies were found to be lacking in all but a few of the MNCs studied. Multidisciplinary environmental expertise was, in short, "compartmentalized" into separate boxes.

d. Had there been involvement of environmental professionals in previous similar projects?

All but a few of the planning processes were found to be using inputs which originated from the previous involvement of environmental professionals in similar prior projects. This former, but currently relevant, experience was incorporated in a number of ways. A few of the chemicals projects investigated were almost identical to projects that had been recently implemented by the firms in other locations. According to the executives interviewed, the process schemes going into the current projects were the result of fairly extensive efforts by environmental professionals during the late 1960s to make the process less pollution intensive. In the case of one of the steel projects, the firm had recently attempted to establish a grassroots steelworks at another location. During this attempt, which was eventually rebuffed by public pressure, a broad range of environmental professionals had been involved in studying expected impacts and in helping to create a program of environmental safeguards. Much of this

involvement resulted in findings and solutions which were subsequently incorporated into the project examined in this study.

In other cases professionals had been previously involved in remedial efforts or environmental impact monitoring undertaken at existing similar facilities. One of the metals firms had previously been subjected to tremendous public pressure to clean up its existing facilities in the U.S. In carrying out the required remedial efforts, it had involved many environmental professionals in order to document actual damage and pinpoint corrective solutions. According to an executive of this firm, the results of this involvement were fully applied in the specific project investigated in this study. In a few cases the MNCs were able to utilize environmental impact data which had been gathered by professionals in conjunction with already existing plants. A case in point was that of the petroleum refinery project where significant use was made of residuals impact data collected by biologists at a number of the firm's other refineries.

2. Systematization

The dimension of systematization is concerned with the utilization of systematic, analytical techniques and procedures in the review and consideration of environmental factors during project planning. Systematization is viewed

to be essential for two basic reasons. First, an objective understanding of project impacts can probably best be achieved through the use of rational and systematic techniques. Second, the difficulties inherent in putting environmental incommensurables into the decisional balance requires that the information be gathered, organized, analyzed, and displayed in a form conducive for use in decision-making.

Generally speaking we found the consideration of environmental factors in MNC project planning to be moderately systematized. The use of systematic methods was often done for primarily defensive reasons. In addition, these methods were employed almost exclusively in "descriptive tasks" and were usually focused on matters of "residuals discharge." The five question and answer sections which follow contain the findings on this dimension.

a. Were ecological baseline surveys conducted?

Prestartup (i.e., prior to beginning plant operations) ecological baseline surveys were completed, in progress, or planned in two-thirds of the project cases. The expressed reasons for conducting baseline surveys were predominantly defensive in nature. As one aluminum smelter project manager expressed: "In this day and age you've got to cover yourself against accusations of environmental damage which are not really caused by your plant." He went

on to relate two examples of how a prestartup survey done in conjunction with a new smelter had already proved valuable. In one instance the firm was accused of fluoride damage to nearby barley crops. In the other it had been accused by a local bird-watchers group of killing rare sea birds. In both cases the existence of prestartup fluoride concentration measurements (e.g., in vegetation, sea water and wildlife) made by an independent team of university researchers proved valuable, because the firm was able to show that the concentrations had not increased since the beginning of plant operations. Further research established that the vegetation damage was caused by sulphur dioxide from nearby coal operations and the bird damage by parasitic agents.

A few of the MNCs which did not conduct baseline surveys in conjunction with the specific projects examined in this study made it known that they only do these surveys when either the law requires it or when the site environs includes some special ecological feature or species. "The situation controls how much baseline work you do," commented one U.S. chemical company project engineer. His firm had recently initiated baseline studies in connection with two other projects: one located near a rare azalea cyprus garden, and the other on an estuary where commercial salmon fishing was important.

b. Were environmental impact assessments performed?

Environmental impact assessments were performed (i.e., formal impact statements were written) in only four of the project planning cases investigated. Two of the impact assessments were required by law. In one of the voluntary cases, the European petroleum firm defined the objectives of the exercise as being:

> 1) to identify any particular problem areas which could be avoided by technological alternatives or possibly re-routing;
>
> 2) to identify particular ecological aspects which may cause local or wider concern in relation to flora or fauna;
>
> 3) to identify the interests most likely to be concerned over (2);
>
> 4) to collect or otherwise acquire data designed to rebut allegations against any aspect of the project by interests opposed to the granting of the necessary permits;
>
> 5) to put data so obtained into a convenient form for use in support of applications to governmental or statutory bodies for permits, wayleaves, etc., to provide the background evidence for the preparation of the company's case in the event that public interest hearings should be set up, and also to be available for use at meetings designed to inform the public or specific private interests concerning the project.

According to executives from this same firm, the impact assessment (and resulting five-volume statement) had three primary benefits:

> It's not the final document that is valuable, that is just a piece of history. The benefits of the exercise were threefold. First, it forced our engineers to consider, in a disciplined way, environmental factors at the design stage--every

> action had to be fully justified environmentally. Second, it had commercial value, in the sense that a very large amount of information was available for those project people who had to talk with the various affected publics and government agencies. Third, the exercise helped us to avoid serious delays as we were always one step ahead of the public objections. We could have easily been confronted with a two-year delay if we had not been able to satisfy these objections. With inflation going the way it is, we actually saved quite a bit of money by being able to build now, rather than later.

Conducting environmental impact assessments can be very costly, as can be shown perhaps most dramatically by the case of the Trans-Alaska Pipeline. Spurred by the requirements of N.E.P.A. and backed by vigilant environmental groups, more environmental research was done in association with this project than any other construction project in history.[1] The U. S. Interior Department environmental impact study on the pipeline cost $9 million, and the Alyeska Pipeline Service Company spent more than $35 million on environmental research.[2] In another more recent case, a combine headed by Gibbs Oil of Boston, Burmah Oil, Northern Illinois Gas, and Lovett C. Peters Associates spent a reported $2.5 million in an environmental impact study preparatory to making formal application for a 250,000 barrels per day, $450 million petroleum refinery near Sanford, Maine.[3]

The few environmental impact statements examined in this study were of mixed quality. In one case the document appeared to be an after-the-fact, self-serving statement

made on a project conceived and designed long before the statement was written. The thick document read like a project promotion, was superficial in many areas, and suffered not so much from errors of commission, but from errors of omission. This criticism is not surprising, however, as the same problems have been evident in many of the impact statements prepared by U.S. federal agencies on their projects during the past few years.[4]

Less formal and extensive attempts at an environmental impact assessment were made in three other projects. In the petroleum refinery case, the firm responded to the identified community concerns by producing a report entitled "Opinions on Objections," in which a range of potential environmental impacts were examined in terms of their potential magnitude and adversity. In the ore mining project, a joint company-citizen group committee produced a stream of mini-environmental assessments over a four year period. In the alumina case, the firm decided to present selected issue-oriented impact assessments by means of expert testimony at the public hearings. Consultants expert in the effects of "red mud" on water quality, SO_2 on vegetation, noise, and odor were gathered and brought to the hearings for "on the stand" impact assessments.

c. Were programs of residuals monitoring planned?

Programs of residuals discharge monitoring were made a part of every project examined in this study, with one exception. This was a smelter project in which only a "quick and dirty" (as characterized by the project manager) visual monitoring program was planned. The monitoring programs varied widely in their sophistication, content, and comprehensiveness. The scope of each was usually determined by the demands and reporting requirements of the planning permit or pollution control license obtained. The availability of reliable monitoring equipment was also mentioned as a determining factor. Continuous monitoring of residuals discharge was planned for in only a few cases; periodic measuring systems (e.g., once a day, once per week, once a month, every three months, etc.) were most common.

The alumina plant case serves as a good example of a comprehensive residuals monitoring program established via prescribed planning permit conditions. Discharge standards and monitoring requirements were set for all major residuals, including sulphur dioxide, dust, waste water, pH, oil, heavy metals, etc. The conditions called for a mix of continuous and periodic monitoring, and set forth details on sampling points, sampling platforms, and reporting of records to the planning authority.

d. Were programs of environmental media monitoring planned?

It was stated above that prestartup ecological baseline surveys were conducted in nine project cases. In only four of these, however, were provisions made for follow-up repeat surveys or periodic monitoring of the ecological conditions. Reliable information on real impacts can only be obtained if the effects of residuals on media such as air, water, vegetation, and wildlife are monitored. Why expend considerable efforts at the prestartup stage measuring and describing site location ecological conditions if there is no intention to assess actual impacts on these conditions after the facility is in operation? One is forced to question the efficacy of the prestartup work and to suspect a superficial "window dressing" motivation.

Environmental media monitoring is sometimes required by the planning permission. Just as residuals-discharge monitoring was prescribed in the alumina plant case discussed above, so was media monitoring:

> The developer shall prior to starting production establish continuous ambient sulphur dioxide monitors in the area at locations to be decided by the planning authroity. The developer shall also measure deposited dust at these locations and determine the contribution of alumina and bauxite.
>
> The developer shall monitor water quality continuously at two suitable points to be agreed with the planning authority, upstream and downstream of the marine terminal. The parameters to be monitored shall be pH and temperature.

The benefits of site location environmental media monitoring (and/or periodic baseline studies) were forcefully expressed by an environmental coordinator in one European petroleum firm:

> We use ecological monitoring as a pragmatic, management tool. We attempt to ask precise, simple questions--we are not in an academic research sense anxious to know the effects of a refinery, a pipeline or terminal on the total ecosystem. We ask three questions: 1) does the facility have a detectable effect on key ecological parameters? 2) if there are effects, how large are they? and 3) is the effect positive or negative with regard to the stability of the ecosystem? This information can be valuable in five different ways: 1) we have solid data which can be used as justification for changes of practice and be given to our engineers to design project modifications, 2) having this information helps guard against spurious allegations--we can genuinely assess all allegations, 3) we can better tell if the adverse effect is caused by our operations or by somebody else, 4) we obtain valuable feedback for new designs and expansions, and 5) we can share the data and better argue with the responsible authorities concerned.

e. Had there been previous relevant environmental investigations?

More than half of the MNCs were able to employ the results of previous systematic investigations in their current planning processes. These investigations and analyses had been conducted in conjunction with similar types of projects or facilities. Two-thirds of the firms had the results of residuals discharge monitoring at existing similar facilities available to them for guidance in planning the new project. In two cases the firm had available the results of previous impact analysis and/or media

monitoring. The environmental advisor of the petroleum refinery project gathered a lot of design ideas by closely studying data from prior- and post-baseline studies carried out at three major refineries. In the case of the natural gas pipeline, the firm closely analyzed the wide ranging environmental research results of the Trans-Alaska Pipeline project. As one executive put it: "We went to school on the Alyeska Pipeline Service Company!"

In a few cases the firms employed the results of prior studies conducted when similar existing facilities were converted to meet stricter standards. The firm executing the hydrofluoric acids plant, for example, had recently completed studies on how to bring their existing plants into line with new air quality performance standards promulgated in the U.S. Other firms had available the results of recent studies carried out for almost identical plants. The firm associated with one of the metals expansions had just gone through the concession planning permission procedure for its existing plant (which had been operating without a permit). The environmental report prepared for procuring this permit was viewed by the planners of the expansion to contain most of the environmental information they would need.

In those few cases where previous environmental investigations were lacking, the project was either a new one to the firm concerned, one in which the last similar

project planned had been years ago (before the "time of environmental concern"), or one in which no pressures for environmental cleanup had been placed on the firm's similar existing facilities.

3. Inclusiveness

The dimension of inclusiveness is concerned with the scope of environmental impact considerations reviewed and evaluated during project planning. A comprehensive point of view is essential for environmentally-oriented planning of large-scale industrial projects due to the fact that they usually consist of complex systems of related actions from which different kinds of environmental impacts may result. The environments into which projects are introduced are also complex systems of resources, functions, users, and their interrelationships.

As a rule we found a moderate level of inclusiveness in MNC project planning. Predominant planning attention was usually focused on issues of process-related residuals discharge with generally only shallow attention being directed to potential environmental consequences associated with other project actions. This finding and others related to inclusiveness have been organized under the five questions below.

a. Were the baseline surveys comprehensive?

Many of the prestartup ecological baseline surveys that were done were fairly comprehensive in their scope. The environmental description for the LNG import terminal project, for example, was quite broad; it included multiple parameters in each of the following categories: air resources, aquatic environment, terrestrial environment, noise environment, socioeconomic environment, hazards environment, and aesthetic environment. Component studies involved in the preparatory environmental research program of the natural gas pipeline consisted of eight major areas, some of which were mammology, ornithology, archaeology, and socioeconomic impact. The manager of the alumina project proclaimed: "We were willing to study anything that anybody thought would be a problem, however ridiculous it happened to be." The program of ecological research in this project dealt with seven major areas: vegetation, marshland, birdlife, noise, monuments, air quality, and water quality.

The most comprehensive program of baseline research was planned in conjunction with the petrochemical complex project. In this case the firm was requested by the governmental agency to prepare an "Existing Environmental Profile" (i.e., a characterization of the existing environmental conditions and their interrelationships as found in

the site location area). The contents of the profile were specified in a letter from the agency director to the project manager which stated: "The following categories need examination:"

A.1 Earth
- construction material
- soils
- landform

A.2 Water
- surface
- ocean
- underground
- termperature, pH, salinity, dissolved oxygen
- turbidity, flocculation

A.3 Air
- emissions

A.4 Processes
- erosion
- deposition

B.1 Flora
- microflora
- aquatic plants including phytoplankton
- mangrove areas

B.2 Fauna
- fish, shellfish, crustaceans, etc., including zoo-plankton
- benthic and planktonic microfauna
- spawning grounds

C.1 Land Use
- coastal flats
- commercial fishing
- industrial use
- quarrying

C.2 Recreation
- hunting
- fishing
- boating

C.3 Aesthetic
- open coastlands
- create misfit in landscape

C.4 Cultural
- life style
- health and safety
- employment
- population growth
- aboriginal relics or sacred sites

C.5 Man-made Facilities
- structures
- transport movements, land and sea
- power, water lines
- wastes to be disposed of (including cooling water)
- fenced and restricted areas
- roads, railways, air corridor

D.1 Ecological
- salinization of coastal waters
- food chains
- salinization of surfaces
- toxic rain water runoff

The "laundry lists" discovered in the baseline surveys were often quite long. Very few attempts were made, however, to synthesize the acquired information into a

systems description format. As Andrews has pointed out: "Impacts affect systems, not just discrete resources or biological species."[5] The absence of this systems perspective would seem to imply that the consideration of environmental factors was in no case truly "holistic."

b. Were environmental impact criteria employed in site selection?

By and large, environmental impact considerations were not found to be a prime factor in the site selection subdecisions of most of the project cases examined in this study. The site selection studies were primarily based on the orthodox criteria of market, transport, labor, energy, geotechnical, tax, construction, and engineering factors. Inputs from ecological investigations were generally not available when the site decisions were made.

Few of the projects analyzed were significantly "location flexible" in their nature. Most site location choices were severely constrained or primarily determined by one or more of the following:

--location of oil/gas pools or ore bodies
--access to existing integrated facilities
--access to industrial markets
--access to low cost power
--access to raw materials supply
--access to deepwater port

In the ore mine, offshore oil, and natural gas projects, the locations of the major drilling or mining

facilities were predetermined by the location of resource deposits. Raw materials access appeared to be the key factor in three of the chemical projects examined. The polypropylene and polyethylene projects were both located adjacent to petroleum refineries for supplies of propylene and ethylene, respectively. The site of the petrochemical project was chosen because of convenient access to salt and natural gas supplies. In the case of both steel projects, the firms were constrained by required access to already existing integrated operations; expansions and/or modernizations were being made on individual components of integrated operations. Pipeline-related projects depended on access to existing facilities, either backwards to production operations or forward to marketing operations. Low cost and available power was expressed to be the dominant site selection criterion in three cases, all of which were power-intensive metals smelters. As one project manager expressed it: "The whole key to this project was the availability of low cost hydroelectric power." Access to deepwater ports capable of handling deep draft vessels appeared to be a dominant requirement in the case of the petroleum refinery, the alumina plant, and the LNG import terminal.

The finding that ecological considerations were generally not prime factors in site selection does not mean, however, that they were entirely absent. The pipeline

routings involved in the natural gas pipeline and offshore oil development projects, for example, were done with ecological criteria in mind, even though the locations of other project facilities were pretty much resource fixed. Ecologists participated in the first helicopter route planning surveys for the gas pipeline project. In the offshore oil project, the land-based pipeline siting was done partially on the basis of an environmental resource rating assessment of land form and land use. One of the many site selection requirements for the alumina project was a suitable adjacent "red mud" residue disposal area. Prior to the ore mining development, a team of engineers evaluated thirty-six potential locations for the milling operation and tailings pond site within a twenty-five mile radius of the ore body:

> Four criteria were employed in evaluating the potential locations: 1) it had to be located off stream to minimize the possibility of water pollution, 2) it had to be located so that the danger of flooding would be eliminated, 3) it had to be economical, and 4) it had to be exposed as little as possible to public view. Of the thirty-six sites, only two were found to be environmentally satisfactory and one of them was chosen for the project.

The indirect influence of environmental considerations on site location was seen to be operating in a few other cases. In the case of the petroleum refinery, the firm had been blocked in expanding and modernizing a nearby existing refinery because of residential encroachment

(i.e., housing units right up to the plant fence). The steel modernization-expansion project came into being because the firm had found its plans for a new grass-roots project blocked and decided instead to modernize and expand one of its existing facilities. The firm involved in the aluminum smelter expansion rejected an alternative proposal to build a new grass-roots facility, largely because of economic factors, but also because they did not especially want to face the expected environmental opposition that such an endeavor would entail. One chemical firm had selected its isolated site largely for non-environmental reasons, but when evaluated on an after-the-fact basis, found that they had chosen a good site for future projects that might involve problems such as flaring, odor, and noise. In another chemical project, the firm ruled out from the beginning consideration of certain parts of the host country where environmental groups were extremely active and where vehement protest, adverse publicity, and delays could be expected.

These site selection findings relate closely to the much discussed issue of environment-induced locational shifts of MNC activity. An examination of 1) recent MNC locational behavior, 2) the motivations of foreign investment, 3) the characteristics of pollution havens, 4) the importance of energy and engineering factors, and 5) the behavioral characteristics of MNC executives, has led this

author to conclude elsewhere that the flow of MNC investment in response to different environmental standards is likely to be insignificant.[6] A slight shift at the margin has indeed been introduced into the locational calculus of foreign direct investment, but for most MNCs the shift does not appear to be signficant enough to counterbalance the higher costs and risks involved in seeking out a "pollution haven" for major new facilities.

c. Were environmental impact criteria employed in process technology selection?

Significant current planning attention to environmental impacts in the evaluation and selection of the project's central process technology was evident in more than one-half of the project cases examined. In only three cases was the amount of attention very slight, and these were all instances in which the firm was apparently taking an existing project design "off the shelf" and "plopping" it down on another foreign site. In all the other cases either one of three conditions was present: 1) the project entailed a relatively new and large-scale engineering challenge, 2) the project, although using relatively standardized technology, still had unsolved associated environmental problems, or 3) the project had a strong environmental performance motive and technology was viewed as the key element at stake.

In the new large-scale engineering challenges, the evaluation and selection of major project technologies was generally done with environmental considerations in mind. The developer of the natural gas pipeline project spent over $7 million in 1973 on pipeline construction research in order to sort out alternative engineering and construction plans based on intertwined economic, safety, and environmental factors. Before choosing a vast network of pipelines, the developer evaluated the economic and environmental costs and benefits of a number of other gas transport ideas. In backing the pipeline network, it decided for safety and environmental reasons to "overbuild it;" that is, to try to have it so strong in the first place that it would not leak or break. In the ore mine, the firm designed its tailing pond system on the basis of environmental criteria, and engineered a flood control dam, diversionary canals, and a recycling system to bring its designs to fruition. Safety and environmental factors played a large role in determining the methods of storage and transport to be utilized in the LNG import terminal. Alternative technological solutions (i.e., pipeline versus marine) in the offshore oil development were evaluated on environmental impact grounds.

Considerable attention to environmental aspects of process technologies was also evident in the projects employing more standardized technologies, but which still had associated unsolved environmental problems. In the

petroleum refinery, for example, a great deal of engineering effort was expended in finding solutions to problems of noise, glare, odor, water reuse, and oil spills. Many modifications were incorporated directly into the process scheme prior to the design of terminal treatment facilities. In the aluminum smelter case, the firm decided largely on the basis of environmental investigations to use prebake reduction cells, to switch from wet to dry scrubbing on one of the potlines, and to raise the stack height in order to gain dispersion punch. An entire process idea in the petrochemical project, that of shipping liquid chlorine, was killed early in the game as it was judged to be "too risky environmentally."

Environmental considerations played a central evaluative role in all three of the metals expansions or modernizations. In each case, alternative technologies (in steel, for example, the LD versus OBM process, and LD versus LDAC process) were evaluated on environmental control performance grounds.

d. Was the scope of considered impact-causing actions comprehensive?

The scope of causative actions considered in MNC project planning was generally found to be quite narrow and restricted to residuals discharge actions. In seven of the cases examined, little or no attention was accorded to

the possible environmental impacts associated with preconstruction, construction, transport, raw materials, product output or inducement actions of the project; ecological incorporation was restricted to a concern with pollution.

In only one-half of the projects did we observe any semblance of concern over construction and transport actions. In the natural gas and offshore oil projects which both involved underwater and land-based pipelines, a concern with construction impacts appeared paramount. A great deal of research effort in the natural gas pipeline project was directed towards identifying techniques and methods of pipeline construction which would minimize environmental damage. Special concern was accorded to the impacts of heavy construction equipment moving over fragile tundra vegetation. Construction of the pipeline river crossings in the offshore oil project was scheduled to be carried out at a time of the year when salmon migration and other disturbances to marine life and wildfowl population would be minimized.

In the ore mining project, culverts and trestles of the surface railroad were designed so as to accommodate the movement of elk and deer. Also, considerable attention was given to construction methods. Bulldozing activities were kept to a minimum, access roads were routed to avoid cutting down trees as much as possible, trees were transplanted, hundreds of acres of land were reclaimed, power transmission

lines were layed out in a zig-zag pattern, horses instead of tractors were used to haul out felled trees, topsoil was stockpiled for eventual land relcamation, and so on.

Actions affecting aesthetics were given attention in both the petroleum refinery and alumina plant projects. Plans for a landscaped "greenbelt" and buffer zone were made in the refinery project; attention to architectural design and coloration in order to blend in with the local setting was evident in the alumina project. As the project manager expressed it: "We are going to try to make this plant look like one that belongs to the same owner!" The preconstruction excavation of historical monuments was also a part of project planning in this case.

Transportation system action impacts were considered in a handful of the projects, particularly those involving marine transport systems. In the LNG import terminal project, for example, considerable attention was paid to the impacts of dredging and possible spills at the terminal site. In one smelter project, however, the project environmental advisor maintained that there were "no environmental aspects connected with the associated planned deepwater port."

e. Had environmental impact criteria been previously employed in designing the project's process technology?

We have found that most of the MNCs had expended prior engineering efforts, although in different degrees,

to solve the process-related environmental problems associated with the projects examined in this study.

In five project cases (e.g., hydrofluroic acids plant, polypropylene plant, ferrosilicon smelter, petrochemical complex, and aluminum smelter), the previous environmental engineering attention had been very substantial. The firms involved had previously devoted a great deal of effort to cleaning up existing similar operations, to adjusting process schemes in order to have less residuals ouput, and to designing improved methods of "end-of-the-pipe" treatment. As one chemical project manager stressed: "We had already tightened up on pollution control in this kind of plant . . . over the last eight years a lot of ecological factors had been considered by our technical people in advancing the process technology."

Evidence of previous attention was observed in other cases, but to a lesser extent. In these cases the firms had either been engaged in a limited amount of remedial "band-aid" work at existing similar facilities or had been able to piggy-back on published environmental engineering work done in association with similar projects by other firms. In a few other projects, the amount of previous environmental engineering attention was very low. In the alumina plant, for example, this project represented the first occasion that the firm was really subjected to pressures for stringent environmental control in this kind of plant.

Most of the firm's older alumina operations were located in less-developed nations and had been constructed many years before.

4. Public Participation

The dimension of public participation is concerned with the efforts expended in order to obtain the views of, and to inform, the publics which may be affected by the project. These efforts would appear to be essential if project planning is to be sensitive to social values concerning the use of affected environmental resources.

On the whole we found a rather low level of public participation in MNC project planning. Project planning was rarely an open and participatory process. Most often it was secretive, exclusionist, low profile, and "official channels only" in character. Six questions and answers related to various aspects of public participation are presented below.

a. Were locally-based environmental consultants utilized?

It was reported above that external environmental consultants were brought into project planning in more than one-half of the cases examined. These consultants were typically either fully or partially locally-based (i.e., based in locations in the vicinity of the proposed project

site). The expressed reasons for utilizing local expertise were threefold.

First, local environmental consultants were considered to have the best familiarity with the site ecosystems in question. Natural science professors and researchers from nearby universities and scientific research institutes were employed in seven of the project cases. These professionals were considered to possess valuable accumulated knowledge about the local area which could be brought to bear on the project. In a few cases, the firms stated that by engaging local university professionals, they were better able to identify any environmental research projects currently underway which might be adversely affected by the project.

A second reason for bringing in local consultants was political in nature. The output of local professionals was generally considered to have a greater credibility with local authorities and publics as compared to research done by outsiders. "The local political scene indicated that locals had to be used," commented a petrochemical complex project manager. A manager of a U.S. firm investing in Europe expressed: "The need to keep a low U.S. profile demanded the use of locals. Furthermore, local professors possess a 'political sensitivity' that our own people could never attain."

A third expressed reason for using local consultants was to cultivate cordial relations with local influential scientific organizations and research institutes by "throwing business their way." Local scientific community support was seen as a valuable asset, which could be especially important if disputes or controversies were to emerge at a later date. By involving local scientists in the project planning process, and by promising continued involvement in repeat or further studies, the firms were in effect attempting to develop a long-term asset of "goodwill" through the creation of "commitments" from the local scientific community.

b. Were surveys of local environmental values conducted?

Formal survey research of local community environmental quality values and perceptions was conducted in only five of the project planning cases examined in this study. In two-thirds of the cases, therefore, local values were either determined through indirect means (e.g., reliance on governmental officials or local consultants), or not at all.

In two instances the survey research was quite extensive. In the petroleum refinery project, for example, a public opinion poll was taken in the site community. The purpose of this poll was to determine the community's attitudes on having a refinery "in their backyard," the community's understanding of what a refinery was, and the

community's awareness and perceptions of the firm making the investment. The results of this "market research" were utilized in planning a communications and community involvement program. In the case of the LNG import terminal, the environmental consulting team conducted a formal media review (e.g., local press) and studied over 200 reports to determine the concerns, needs, goals, and problems of the site region.

Survey research was observed to be present, but to a lesser extent, in three other planning processes. In the natural gas pipeline project, some sociological and social-psychological survey work was initiated with regard to the impact of the line and its construction on remote native villages. A newspaper clippings file was developed in the petrochemical project, and by means of crude editorial analysis, the environmental and legislative climate was "mapped." Finally, in the steelworks modernization/expansion case, the firm initiated a series of twelve community meetings, at which the project was explained and local values and concerns were pinpointed.

c. Was there active seeking of community input?

Community and citizen environmental group input was actively sought during project planning in only a few of the cases examined. The most extensive effort was observed in conjunction with the ore mine. In this case a hybrid

committee of company executives and representatives from local citizen conservation groups was created during the early stages of project planning. The committee met periodically over a long period to discuss, monitor, and make suggestions about the development of the ore body. Although both sides were apprehensive at first--the conservationists afraid of public relations gimmickry, and the company of unreasonable demands--a deep sense of mutual understanding and trust reportedly grew as the committee worked together. The company's environmental director, who was principally responsible for launching the effort, stated that the committee experiment had the following benefits: it opened up avenues of communication with those holding strongly conservationist points of view; it brought into the planning process a broad range of necessary and low-cost environmental expertise; it helped to prevent the development of an atmosphere of emotionalism, animosity and distrust; it perhaps reduced the potentialities of media battles and legal action; it appeared to increase public and citizen group acceptance of the project, and in general, resulted in a project in which many potential environmental problems were eliminated or at least minimized and controlled.

Executives from the firm planning the petroleum refinery discussed the project with a wide range of community organizations: scientific institutes, schools, political parties, community clubs, sports clubs, labor unions,

and citizen action groups. In the offshore oil project, the firm's planners and environmental staff had broad-ranging consultations about the pipeline route with representatives of a number of conservation, wildlife, farming, fishing, and ecological research groups. As expressed by one executive, "We attempted to approach virtually every proprieter, occupier, and interest group likely to be affected and listen to their concerns." In the petrochemical complex project, the consideration and seeking of local opinion was demanded by law: as the project manager was instructed by the director of the environmental agency--"local opinion must be sought."

More circumscribed efforts to seek out local input were observed in five other projects. In these cases, discussions or negotiations with a limited range of local interests (e.g., farmers adjacent to the site, etc.) was the general pattern observed. No attempts to seek local advice were made at all in another six cases. Discussions were restricted to the relevant public authorities. One European chemical project manager explained the lack of advice seeking as follows:

> There were just not enough qualified people in the village who could understand what we would be talking about. We haven't found a good way to translate the difficult technical problems for people who don't have any understanding of that side of the business."

Some executives claimed that such efforts are not really necessary as the local public planning agency is

usually capable of looking out for the interests of the community. A few firms appeared deathly afraid of interacting with citizen environmental groups, viewing them more or less as uncompromising radicals intent only on promoting chaos in order to delay or block the project. As one project manager expressed, "We prefer to deal with these groups only in the context of a well-controlled formal public hearing."

d. Were community information programs initiated?

Extensive, voluntary, and open public disclosure of project plans occurred in only four cases: the ore mine, petroleum refinery, steelworks modernization/expansion, and offshore oil complex. The fullest information program was generated in the case of the petroleum refinery and involved a tripartite program of informative brochures, public meetings, and telephone communications. Two brochures were circulated widely in the community. One provided a general background on oil, refining, and environmental protection. The other spelled out the firm's plans for being a "good neighbor," and documented the environmental protection measures going into the project. Each brochure included a gift of a cut-out game for children and a phone number by which the citizens could get in contact with the firm's environmental experts. The firm also organized a series of open public meetings to explain the proposed project.

The developer of the offshore oil project produced a special newspaper for the public which included such articles as "Conservation: That's the Name of the Pipeline Game," "A Trip Through Pipeline Country," "Careful Planning and Development," and "Oil--New Hope for the Jobless."

The need for openness in communication was expressed by one metals executive as, "You've got to avoid letting the community think that your are pulling something behind their back--feelings of resentment and disaffection emerge, wild rumors start flowing, and all hell generally breaks loose." The same point was made in fuller detail by another metals executive as follows:

> Our traditional approach to project planning was to say nothing until the last moment, and then present the complete package. We have learned that this approach is no longer acceptable, because no matter how carefully the package may have been prepared, it comes as a surprise to the public and conservationists and is thus regarded with suspicion. And worse, since the company will feel that it has already optimized its solution in arriving at its firm project plans, it will tend to be fixed in its reactions to comments. Most often those reactions will be negative and unyielding. Lines will get drawn and arguments will result.

Communication efforts designed to develop an informed community are inextricably intertwined with strategies of getting project approval. As was readily admitted by those firms who initiated extensive information programs, the primary objective was "persuasion," not simply unbiased communication. No attempt was made in this study to

distinguish efforts aimed to persuasively convince from efforts designed to objectively inform.

The range of possible "persuasion-approval" strategies has been well documented in the case of petroleum companies' attempts to get refineries in the New England region of the United States:

> In the past decade, refinery promoters have tried strategies from razzle dazzle and high level influence to quiet cooperation with local officials, in efforts to overcome New Englander's skepticism and environmentalist objections. During early 1974, Olympic Refineries Inc. (owned by Aristotle Onassis) employed hard-sell tactics in an attempt to get approval from Durham, New Hamshire to build a $600 million oil refinery there. The approach involved a controversial saturation campaign aimed at convincing New Hampshiremen that a refinery meant more jobs, lower taxes, and cheaper energy without harming the coast. The tactics included 900 radio spots in the state, eight-page advertising supplements in most local newspapers, televised public meetings featuring a flock of consultants, and expense-paid trips for legislators to Quebec to view a clean refinery there.[7]

Executives in a few MNCs warned that a big public relations campaign can sometimes be counterproductive. "Massive PR does not always work--we have seen recent cases where it turned against us," expressed a public relations manager of one large European petroleum firm. He went on to admit that his firm still does not know how to handle the communications and project approval process: "Each case is a bit different--a different contact approach seems to be required in each project situation."

In those seven cases where no communications efforts were initiated, the firms involved expressed the view that a "low profile" strategy was generally thought to be the most successful approach. These firms preferred to deal solely through official governmental channels rather than deal with the general public.

e. Were special educational efforts initiated?

Special efforts such as inspection tours, gifts of monitoring equipment, and technical education programs were initiated in one-half of the projects examined. These efforts, in a similar fashion to community information programs, are also part of the larger "persuasion-approval" strategy employed by MNCs.

In four project cases the firms provided expense-paid trips for governmental officials or representatives from local environmental groups in order for them to visually inspect similar existing facilities. In three of these cases (the alumina plant, petrochemical complex, and ferrosilicon smelter), top governmental officials were provided with tours of facilities abroad. In the petroleum refinery case, the firm took a busload of local officials and conservationists to visit a relatively new refinery in another part of the country. During the visit, one conservationist asked the refinery manager to drink a glass of the water effluent, which he reluctantly did. As the manager

apparently suffered no ill consequences, the firm has now reportedly made it a standard procedure in their public plant visit programs!

In two cases, the firms made gifts of air monitoring vans or stations to the local governments. The firm concerned with the petroleum refinery project presented to the city council a van equipped to monitor hydrocarbons and NO_x. As one executive commented: "This visual effort made a good impression on the people; by giving them the ways and means to control us, it demonstrated our confidence that the air would remain clean." The company involved in the aluminum smelter project established a series of monitoring stations with the local city council. "This was an effective placebo for the local public," said the project's works manager.

In two cases where the relevant governmental agencies were rather unprepared to deal with the proposed projects, the firms involved initiated extraordinary efforts to keep the officials informed and to educate them as to the environmental and technical problems involved. This was explained by one pipeline manager as follows:

> We found the two agencies to be quite uneducated as to the environmental problems related to the project. We felt that an ill-informed agency would in the long run present more problems than one fully knowledgeable of the problems and technical solutions. Thus we decided to go out of our way in having close contact, frequent meetings and lots of technical correspondence.

f. Had there been previous and relevant public interaction?

Public participation can often be implicitly contained in a current project planning process by virtue of the firm's accumulated learning from previous "project-environment-public" interactions. Previous "sensitization" to public concerns regarding environmental impacts perhaps reduces the need to have further current participation. Almost all of the firms executing projects in this study were found to possess previous interaction experience, but in different degrees. The only exception was that of the alumina project in which the firm involved had never before been subjected to public pressures for environmental control in this type of facility.

The amount of previous interaction was observed to be quite substantial in eight of the cases. The firm executing the steelplant expansion had just recently experienced the entire process of community public hearings in gaining a concession permit on its existing facilities. In the steelworks modernization project, the firm had recently been rebuffed by the opposition of citizen groups and government agencies in attempting to establish a "grass-roots" integrated steelworks. The firms associated with the other five projects had previously experienced a great deal of interaction in conjunction with remedial efforts at existing

similar facilities or new similar projects in the countries of Canada, Germany, the United States, and Japan.

5. Continuousness

The dimension of continuousness concerns the temporal integration of environmental considerations into the various phases of project planning. Environmental impact information needs to be available at all relevant points in the planning process at which project action alternatives with different environmental consequences are evaluated and selected. Early consideration, before alternate sites or palliative project design actions are foreclosed, is especially critical.

By measuring the early integration of environmental information, we generally found a low level of continuousness in MNC project planning. Efforts to seek out community values and to obtain ecological data were generally done only at a late stage of the planning process. Project design activity was thus carried out without the benefit of such knowledge. The "discontinuous" and "late-stage" nature of considering environmental factors is discussed in three question and answer sections below.

a. Was there early citizen participation in the planning process?

Evidence of early citizen awareness and participation occurring at least nine months prior to formal public

hearings was found in only three project cases. In the offshore oil and petroleum refinery projects, the programs of meetings, discussions, and information dissemination were begun nine to ten months in advance of making formal permit applications. Representatives from local environmental groups were brought into the planning process almost a year in advance of the start of formal permit negotiations for the ore mining project. The citizen participation was done early enough in all three cases to allow for meaningful project modifications as a result of that participation.

Citizen awareness and participation occurred only two to five months prior to formal public approval procedures in another five projects. A case in point was the alumina project in which meetings with various farming and conservation groups did not take place until a few months before the public hearing. As the environmental advisor assigned to the project lamented, "There's a lesson to be learned here; early contacts with these groups probably could have alleviated the emotional hearings and eleventh hour crises that we had to deal with . . . emotional public hearings are not good for anyone."

Citizen participation was either insignificant or attempted only at the last moment in seven of the projects studied. As one example, the local community was given advance notice of the aluminum smelter expansion only two weeks before the formal hearing. The use of such "surprise

tactics" was viewed by some MNC executives as an effective means of gaining project approval. They believed that potential adversaries could be caught off guard and thus hindered in their efforts to marshall forces. In addition, the argument of "we've already invested substantial time, energy, and money into this project" could be used by firms as a powerful bargaining ploy.

b. Was the baseline survey done early in the planning process?

Of the ten project cases in which ecological baseline surveys were conducted, in only four were they performed before the range of choice had not already been severely constrained or narrowed to a single favored project design. The program of environmental research in the natural gas pipeline project began almost at the start of planning. As the environmental director stated, "We needed those inputs for construction and project engineering planning and furthermore did not want to be accused by the government of having a preconceived nation!" Although the research program got an early start, its pace over time was being guided by the rate at which the gas field reserves were "proving up."

The environmental studies conducted in the offshore oil complex took eighteen months to complete and were phased in at an early stage so that research output, at least in preliminary form, could be available for use in construction

and design planning. In the steelworks modernization and expansion project, the environmental survey work was carried out prior to much of the engineering design. The results of this research were valuable in pinpointing exactly what modernization efforts were required and in determining what expansion actions were feasible given existing and projected environmental conditions. Baseline investigations wre initiated in the aluminum smelter project just prior to the start of scheduled construction. As a result of long construction union strikes, however, the research results became available in time to allow for major project design modifications, which were consequently made as a result of some of the findings.

In the other six cases where ecological reconnaissance was initiated, it was generally done only after public approvals had been received and major construction activity had already begun. In most of these cases the project design had almost been finalized. Some flexibility was still present, however. "In essence the basic design choices were made long ago, but should the research turn up anything really critical, further attention to environmental protection measures could be given," commented one petrochemical complex project manager. In one U.S. chemical company, the project engineer stated: "Our approach is to start site construction after only 20 to 30 percent of the design work is done--this allows us to incorporate further

control measures if the research results indicate they are needed." In a few firms the point was made that ecological research is too costly to pursue prior to project approval. This view was expressed in one metals company by: "Until your get permission you just don't bother with that kind of work; since it takes three to five years to construct the plant, you've got plenty of time to gather the flora and fauna data which the government wants."

As a general rule, ecological reconnaissance efforts were not found to be producing inputs for project design decision-making. Projects were being designed on the basis of criteria other than a complete and substantive knowledge of local site ecosystems. It was evident that the time needed to obtain environmental information had generally not been given sufficient weight in the scheduling requirements of the projects. In short, much of the environmental reconnaissance was apparently being pursued for reasons of self defense or "powdering on the environmental cosmetics," and not for guiding project design.

c. Were there early inputs on environmental impact from previous experience?

Inputs on environmental impact via previous relevant experience were found to be available at an early stage of planning in many of the projects examined in this study. In six projects (petrochemical complex, polypropylene plant,

hydrofluoric acids plant, ferrosilicon smelter, steelworks modernization, and petroleum refinery) the early inputs were quite substantial. The firms involved had recently been engaged in extensive remedial efforts to clean up their existing similar operations or had devoted considerable attention to environmental issues in the context of similar recent projects. In addition, many of these firms were among the largest producers in their fields and were utilizing proprietary process technologies previously environmentally modernized by their engineering staffs.

The amount of previous overall environmental experience was found to be relatively low in five cases: the natural gas pipeline, ore mine, LNG import terminal, offshore oil, and alumina plant projects. In these instances either one or both of the following conditions were present. First, the project involved huge engineering and environmental protection challenges, due to either the newness of the technology being employed, the large scale of the project, or the physical conditions into which the project was being introduced. Second, the firm had experienced little in the way of previous demands for environmental control with this type of project. Either the kind of project was relatively new to their corporate "repertoire" or the last similar project had been executed years before the environmental imperative had begun to exert its influence.

6. Formalization

The dimension of formalization is concerned with the degree to which formal rules and procedures for including environmental considerations in the project planning process have been established internally within the organization. Such rules and procedures are necessary if the process of environmental assessment is to be a serious and careful affair. These provisions would tend to infuse a "climate of accountability" into the treatment of environmental concerns during planning.

By and large we found a moderate level of formalization in MNC project planning. Most MNCs had established formal rules for considering environmental factors, but these related largely only to pollution control expenditure considerations and late-stage environmental staff office project reviews. The three question and answer sections that follow elaborate these findings.

a. Were environmental sections included in the internal project proposals?

Environmental control narratives were contained in the internal proposal of every case examined in this study, but ranged in length from a few pages to over 500. A number of cases were identified in which material prepared for external presentation (e.g., permit applications, public hearings, public relations) was attached to the package of

project documents that was circulated internally for reviews and comments. The need for such proposal information was viewed by most project planners as an "obvious necessity in this day and age." The point was made most forcefully by one European chemical firm executive:

> . . . to arrive at an adequate evaluation of the corporate plans for the future (including pollution control plans), it is necessary that estimates of expected environmental demands be made, along with an appraisal of the consequences they will entail, in the same way as this is done for all other elements (e.g., sales, selling prices, etc.) of an investment plan. In this way the profitability and, by means of a sensitivity analysis, the risk element of the project concerned can be established. The uncertainty as regards future environmental standards potentially involves large financial risks and can threaten the profitability of the project. These risks therefore ought to be analyzed and weighed against the cost of provisions by which they may be obviated.

To supply the means for this economic evaluation, the firm had instituted a requirement that each division prepare a report on the environmental aspects of each major project it proposed. A copy of this report was to be sent to the central office environmental staff and a synopsis was to be included in a memorandum accompanying the investment application. The firm's top management environmental policy group set forth the following environmental aspects (presented here in summary form) to be considered in evaluating a project:

I. Effects of the use of the product on the environment
   A. Restrictions on its use
   B. Recycling

II. Effects of the proudction process on the environment
   A. Types and amounts of pollution
   B. Changes in amounts during the term of the project
   C. Extra loads imposed on environment by production startups, shutdowns, etc.
   D. What transports of hazardous chemicals does the project entail

III. Government standards of pollution control
   A. Present standards
   B. Future standards
   C. Levies
   D. Contacts with authorities (contacts, results, exemptions)
   E. Contacts with people living in the immediate vicinity of the plant

IV. Description and justification of the project in relation to environmental standards
   A. Choice of location
   B. Choice of production process, optimum criteria
   C. Purification plant and waste disposal (including recycling of waste)

V. Financial consequences of the pollution control measures to be taken
   A. Fiscal and financial aspects
   B. Competitive position
   C. Selling price of product
   D. Sales of product

In two-thirds of the cases examined, the capital appropriations request form for the project included a separate section for estimated environmental control expenditures. One U.S. chemical company required two kinds of environmental control information to be on the form: 1) an estimate of total environmental control expenditures, and 2) a signed statement that the planned environmental

protection measures would enable the plant to meet or exceed the firm's prescribed performance standards. In six of the firms studied, the senior coordinator or director of environmental affairs was the executive responsible for getting the environmental spending section on the request form. The need for such expenditure information was expressed by one U.S. petroleum environmental conservation coordinator as:

> . . . For one thing, our firm is under heavy ouside pressure to show how much we're spending to clean up the environment. Second, top management wants to keep the cost aspects of this new issue under a close watch. Third, using rules of thumb, we can usually tell if too little or perhaps too much environmental spending has been incorporated into the project plans.

The environmental control expenditures for two projects were not delineated on the main request form, but were buried in the project proposal. In the three cases where no estimate of environmental expenditures was computed, the firms had either not instituted the requirement at the time of the project or expressed the view that such information was not really useful. "How do your draw the line on what's environmental control spending and what's simple good housekeeping?" commented one aluminum firm project manager. Another metals executive stated: "These costs are too hard to isolate, and as the needs of every project are a bit different, how would your interpret them?"

b. Were the project plans environmentally reviewed and approved by top management?

Extensive and independent environmental review activity on the part of top management was found in only two cases. In the ore mining project, the entire program of environmental research, citizen group participation, and environmental protection planning was fully reviewed and endorsed by the firm's top management team. The Chairman of the Board reportedly exhibited an active interest in the environmental aspects of the project throughout the entire course of planning. In the steelworks modernization project, which was motivated principally by the need for better environmental control performance, the firm's Board of Directors had spent a great deal of time reviewing and approving the plans for environmental protection.

More limited top management review activity was observed in five other cases. In two of these (the offshore oil complex and hydrofluoric acids plant), the project plans were reviewed and approved by corporate level environmental protection committees which included corporate vice-presidents. In the alumina project, the firm's top management committee held an environmental protection "brain storming" session while standing around a scale model of the proposed facility. Environmental planning suggestions (including the idea to present the site city with a gift of an "air quality monitoring van") were offered by the firm's

chairman in the case of the petroleum refinery project. In the petrochemical complex project, the firm's corporate Product Director commented, "I reviewed each and every part of the project on environmental performance grounds and had to be totally satisfied before I sent it up to the Board for approval."

No top management environmental review activity, separate from what might be expected to occur during the regular appropriations request review process, was observed in eight cases. "Top management doesn't have the time to be concerned with such nitty-gritty," commented one executive. Top management review activity was particularly absent in those firms widely diversified and decentralized in structure. As one European metals project manager expressed, "They just expect it to be built in by assumption of agreement."

c. Were the project plans environmentally reviewed and approved by corporate environmental staff?

Formal environmental staff review and approval procedures were observed in eight cases. These reviews typically occurred at a rather late stage of project planning--just prior to submission of the project proposal to top management for review and approval. In these cases, the senior environmental staff executive was required to provide an "endorsement" or "nonobjection statement" to be

attached to the project proposal. These endorsements were frequently required for only the larger capital investments (e.g., over $100,000). The immediate value of these combined review-endorsements was seen differently in different firms. In one U.S. metals firm, the environmental director stated: "The formal last minute review is a rather perfunctory chore, since we attempt to keep on top of each project long before it reaches the stage of top management submission. Frankly, I don't expect any surprises at this stage, and to this day, have not as yet uncovered any." One petroleum company environmental coordinator saw things differently. He commented: "We continue to uncover interesting things in these reviews."

In the remaining seven cases, the environmental staffs only reviewed the projects; no formal approval checkpoint procedures were required. The idea of a formal endorsement procedure was viewed abhorently by a few environmental directors. "Twenty to thirty project proposals come up for top management review each year--I'd need an army of reviewers to handle the load," commented one petroleun firm environmental coordinator. Another said, "I don't particularly want to become a policeman--I'd become totally ineffective if the division people viewed me in that manner." Still another expressed: "Our firm just doesn't work in such an impersonal, highly structured way; things are done more informally here."

C. CATEGORIZATION AND SCORING OF RAW DATA

1. Introduction

Each of the twenty-six questions outlined and answered above related to an indicator of environmentally-oriented project planning behavior. Each dealt with an input or means by which this kind of behavior could be achieved. In this section the questions are transformed into ordinal variables. An ordered set of categories is created for each variable and a linear scoring system is assigned to each category.

The primary objective of categorizing and scoring the qualitative data was to improve the efficiency and sensitivity of data analysis and interpretation. Each of the indicators had been theorized to represent a unique aspect of a single underlying concept--that of ecological incorporation. Construction of a composite index of this concept thus necessitated the transformation of the raw data on the twenty-six indicators into a convenient common language or shorthand. The desire to statistically manipulate the raw data through the use of powerful and well developed techniques also required the categorization and scoring efforts.

A few observations on the working assumptions are necessary. First, because some of the projects examined were still in the planning stage, while others were already in the construction or operations stage, it was

necessary to "equalize" the planning processes. The indicators relate to inputs or means present during the complete course of project planning--from conception through startup. For those projects already in operation, we measured actual incorporation activity. For those projects not yet in operation, we were required to measure actual incorporation activity to date, as well as the explicitly planned incorporation activity due to occur before plant startup. The possibility that planned activity may not accord perfectly with subsequent actual activity was realized, but was not felt to represent a serious problem.

Second, in a few cases the same item was employed in several dimensions, but with a different attribute of the item being measured. For example, we measured "the conducting of a baseline survey" under systematization, "the comprehensiveness of the baseline survey" under inclusiveness, and "if it was done early in the planning process" under continuousness. In an additive sense then, more credit was given for a comprehensive baseline survey conducted early in the planning process, than for one done less comprehensively and/or late in the game, or, of course, not done at all.

Third, "previous experience" indicators have been included in every dimension except that of formalization. It was deemed necessary to recognize and account for the accumulated relevant "ecological incorporation" that was

"embodied" in the current planning processes. In essence, "the ecological incorporation wheel is not reinvented for every project." There are many aspects of environmentally-oriented planning which cannot, however, be handled merely on the basis of past experience. Most importantly, the the characteristics and assimilative capacities of site ecosystems vary widely, as do community concerns and values. Therefore, what might have been appropriate in the past may not be appropriate for the present situation. The system of indicators below allows ecological incorporation to be injected into the planning process by virtue of either relevant past experience or current activity, or through utilization of both. Previous experience was given an approximate weight of one-third, and current activity--because of the diversity identified above--the remaining two-thirds.

2. Construction of Category Sets

Each indicator of ecological incorporation can be conceptualized as a continuum extending from "absence" to "presence" or alternatively, from "less" to "more." In this study these continua have been divided into ordered sets of categories, which have been constructed on the basis of a clear conception of the range and distribution of the particular attribute present among the fifteen cases. Each set involves a single directional classificatory principle

and consists of three exhaustive and mutually exclusive categories. These categories correspond to a logically "low," "medium," or "high" presence of the attribute, or alternatively to answers of "no," "partly," or "yes" regarding questions about the attribute's presence. The category sets as constructed are mostly ordinal in nature. The category of "high" implies a greater presence of the attribute in the planning process than the categories of "medium" or "low," but does not enable one to guage exactly how much greater in an absolute sense.

Appendices E.1 through E.6 present the category sets constructed for all of the twenty-six indicators contained within the six dimensions. Descriptive "anchors" have been attached to each of the three categories of each indicator. Each anchor specifies the kind of observed behavior which would lead a planning process to be identified as receiving the anchor's associated label of either low, medium, or high.

3. Assignment of Planning Processes to Categories

The observed planning processes were assigned to the categories of each indicator by means of a "best fit" rank order procedure. The assembled data on each planning process for each indicator was evaluated against the requirements of all three descriptive anchors. It was assigned to the category whose anchor most closely described the

observed planning behavior. The results of this "best fit" procedure appear in Table IV.1. As is evident, the distribution of the projects across the three available categories varies widely from indicator to indicator.

4. Assignment of Scoring System to Categories

Treating ordinal data (which may or may not be approximately interval) as interval data by arbitrarily assigning numbers to the ordinal categories has been shown to be both a legitimate and useful technique in social science research, especially when the research is of an exploratory nature.[8] This is so because such an assignment, if consistent with the rank order of the categories, rarely alters the results of statistical analysis to an appreciable degree.[9] The small error that may accompany the treatment of ordinal variables as interval is offset by the ability to use more powerful, sensitive, and better developed statistics, by the retention of more knowledge about the characteristics of the data, and by greater versatility in statistical manipulation.[10]

For the above reasons a linear scoring system was assigned to the ordered categories. The arbitrarily assigned numbers of 0, .5, and 1 have been assigned to the groups of "no-low," partly-medium," and "yes-high" respectively. This scoring system is consistent with the rank order or monotonic nature of the three categories. Table IV.2

TABLE IV.1

ASSIGNMENT OF PROJECT PLANNING PROCESSES TO CATEGORIES OF INDICATORS

Dimensions and Indicators	Number of MNC Projects Scoring: No or Low	Partly or Medium	Yes or High
A. Professional Involvement			
1. Current involvement of internal corporate environmental staff	1	6	8
2. Current involvement of external environmental professionals	5	2	8
3. Current involvement of multidisciplinary environmental expertise	6	1	8
4. Previous relevant involvement of environmental professionals	4	3	8
B. Systematization			
1. Prestartup ecological baseline survey	5	1	9
2. Formal preproject environmental impact assessment	8	3	4
3. Program of residuals discharge monitoring	1	1	13
4. Program of site location environmental media monitoring	8	3	4
5. Previous relevant environmental investigations	3	4	8
C. Inclusiveness			
1. Comprehensive prestartup ecological baseline survey	6	1	8
2. Environmental impact criteria employed in site selection	6	6	3
3. Environmental impact criteria employed in process technology selection	3	4	8
4. Comprehensive scope of environmental impact causing actions considered	7	3	5
5. Environmental impact criteria previously employed in design of process technology	2	8	5

continued--

TABLE IV.1--continued

Dimensions and Indicators	Number of MNC Projects Scoring: No or Low	Partly or Medium	Yes or High
D. Public Participation			
1. Utilization of locally-based environmental consultants	5	3	7
2. Surveys of local environmental values and perceptions	10	3	2
3. Active seeking of community and citizen group input	6	5	4
4. Initiation of community information program	7	4	4
5. Initiation of special educational efforts	8	1	6
6. Previous relevant interaction with publics on environmental impacts	1	7	7
E. Continuousness			
1. Early citizen participation in planning process	7	5	3
2. Early ecological baseline survey in planning process	5	6	4
3. Early inputs on environmental impact from previous experience	5	4	6
F. Formalization			
1. Environmental sections in internal project proposal and capital appropriations request	3	2	10
2. Top management environmental review and approval	8	5	2
3. Corporate environmental staff environmental review and approval	0	7	8

presents the assigned scores achieved by each project across all twenty-six indicators of ecological incorporation.

D. A COMPOSITE INDEX OF ECOLOGICAL INCORPORATION

1. Dimensional Scores on Planning Processes

Table IV.3 presents the raw scores attained by each of the planning processes on each of the six dimensions of ecological incorporation. These dimensional scores were created by summing the scores of the component indicators related to each dimension. Note that the possible maximum raw score on each of the dimensions varies because different numbers of indicators were employed in the various dimensions.

In order to achieve an equal weighting of the dimensions, the scores were adjusted to reflect a common maximum score of five. These adjusted dimensional scores are presented in Table IV.4. This procedure was undertaken in preparation for creating an overall summary measure of ecological incorporation which should give the same relative weight to each of the six dimensions.

The adjusted scores attained on each dimension are ranked from lowest to highest in Table IV.5. Tied observations were given the average of the ranks they would have received if there had been no ties. A low rank means that a small relative amount of inputs and means related to the dimension were present in the planning process; a high rank means a high relative amount.

TABLE IV.2

RAW SCORES ON DIMENSIONAL INDICATORS OF ECOLOGICAL INCORPORATION

1 = Yes/High ½ = Partly/Medium 0 = No/ Low Project	Professional Involvement				Systematization					Inclusiveness					Public Participation						Continuousness			Formalization		
	Internal	External	Multidisc.	Previous	Baseline	Impact Assmt.	Resid. Monitor	Envtl. Monitor	Previous	Comprehensive	Site Selectn.	Process Tech.	Causative Act	Previous	Local Consult.	Local Survey	Seek Input	Info. Program	Educ. Efforts	Previous	Early Citizen	Early Baseln.	Previous	Proposal/CAR	Top Mgt.	Envtl. Staff
Polyethylene Plant	½	0	0	1	0	0	½	0	1	0	½	½	0	½	0	0	0	0	0	½	0	0	½	1	0	½
Aluminum Smelter Expansion	1	0	0	1	0	0	1	0	½	0	½	1	½	½	0	0	0	0	0	½	0	0	½	½	0	½
Oxygen Steel Plant Expansion	1	0	0	½	0	0	1	0	1	0	0	1	0	½	0	0	½	½	0	1	½	0	½	½	0	½
Ferrosilicon Smelter	½	0	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	1	0	0	1	1	0	1
Polypropylene Plant	½	½	0	1	0	0	1	0	1	0	0	0	0	1	½	0	0	0	0	1	0	0	1	1	0	½
Hydrofluoric Acids Plant	½	0	½	1	½	0	1	½	1	0	0	0	0	1	0	0	0	0	½	1	0	½	1	1	½	½
Aluminum Smelter	0	1	1	½	1	0	1	0	½	1	0	½	0	1	1	0	½	½	1	½	0	1	½	0	0	½
Alumina Extraction Plant	½	1	1	0	1	½	1	1	0	1	½	1	1	0	1	0	½	½	1	0	½	½	0	0	½	½
LNG Import Terminal	½	1	1	0	1	1	1	1	0	1	½	1	½	½	½	1	0	0	0	½	0	½	0	1	0	1
Ore Mining Development	1	1	1	0	1	½	1	½	½	1	1	1	1	½	1	0	1	1	0	½	1	½	0	0	1	1
Steelworks Modernization	1	½	0	1	1	0	1	0	1	½	½	1	0	½	½	½	½	1	0	1	½	1	1	1	1	1
Natural Gas Pipeline System	1	1	1	½	1	1	1	0	½	1	1	1	1	½	1	½	½	½	1	½	½	1	0	1	0	1
Offshore Oil Complex	1	1	1	0	1	1	1	½	0	1	1	1	1	0	1	0	1	1	0	½	1	1	0	1	½	1
Petrochemical Complex	1	1	1	1	1	1	1	1	1	1	0	½	½	1	1	½	1	0	1	1	½	½	1	1	½	1
Petroleum Refinery	1	1	1	1	1	½	1	1	1	1	½	1	1	½	1	1	1	1	1	1	1	½	1	1	½	1

TABLE IV.3

TOTAL RAW SCORES ON DIMENSIONS OF ECOLOGICAL INCORPORATION

Project	Professional Involvement (max=4)	Systema-tization (max=5)	Inclusive-ness (max=5)	Public Par-ticipation (max=6)	Continu-ousness (max=3)	Formal-ization (max=3)
Polyethylene Plant	1.5	1.5	1.5	.5	.5	1.5
Aluminum Smelter Expansion	2.0	1.5	2.5	.5	.5	1.0
Oxygen Steel Plant Expansion	1.5	2.0	1.5	2.0	1.0	1.0
Ferrosilicon Smelter	1.5	1.0	1.0	2.0	1.0	2.0
Polypropylene Plant	2.0	2.0	1.0	1.5	1.0	1.5
Hydrofluoric Acids Plant	2.0	3.0	1.0	1.5	1.5	2.0
Aluminum Smelter	2.5	2.5	2.5	3.5	1.5	.5
Alumina Extraction Plant	2.5	3.5	3.5	3.0	1.0	1.0
LNG Import Terminal	2.5	4.0	3.5	2.0	.5	2.0
Ore Mining Development	3.0	3.5	4.5	3.5	1.5	2.0
Steelworks Modernization	2.5	3.0	2.5	3.5	2.5	3.0
Natural Gas Pipeline System	3.5	3.5	4.5	4.0	1.5	2.0
Offshore Oil Complex	3.0	3.5	4.0	3.5	2.0	2.5
Petrochemical Complex	4.0	5.0	3.0	4.5	2.0	2.5
Petroleum Refinery	4.0	4.5	4.0	6.0	2.5	2.5

TABLE IV.4

TOTAL ADJUSTED SCORES ON DIMENSIONS OF ECOLOGICAL INCORPORATION

Project	Professional Involvement (max=5)	Systema-tization (max=5)	Inclusive-ness (max=5)	Public Par-ticipation (max=6)	Continu-ousness (max=3)	Formal-ization (max=5)
Polyethylene Plant	1.875	1.5	1.5	.417	.833	2.5
Aluminum Smelter Expansion	2.5	1.5	2.5	.417	.833	1.667
Oxygen Steel Plant Expansion	1.875	2.0	1.5	1.667	1.667	1.667
Ferrosilicon Smelter	1.875	1.0	1.0	1.667	1.667	3.333
Polypropylene Plant	2.5	2.0	1.0	1.25	1.667	2.5
Hydrofluoric Acids Plant	2.5	3.0	1.0	1.25	2.5	3.333
Aluminum Smelter	2.5	2.5	2.5	2.916	2.5	.833
Alumina Extraction Plant	3.125	3.5	3.5	2.5	1.667	1.667
LNG Import Terminal	3.125	4.0	3.5	1.667	.833	3.333
Ore Mining Development	3.75	3.5	4.5	2.916	2.5	3.333
Steelworks Modernization	3.125	3.0	2.5	2.916	4.167	5.0
Natural Gas Pipeline System	4.375	3.5	4.5	3.333	2.5	3.333
Offshore Oil Complex	3.75	3.5	4.0	2.916	3.333	4.167
Petrochemical Complex	5.0	5.0	3.0	3.75	3.333	4.167
Petroleum Refinery	5.0	4.5	4.0	5.0	4.167	4.167

TABLE IV.5

RANK ORDER OF PROJECT PLANNING PROCESSES ON DIMENSIONS OF ECOLOGICAL INCORPORATION

Project	Professional Involvement	Systema-tization	Inclusive-ness	Public Par-ticipation	Continu-ousness	Formal-ization
Polyethylene Plant	2	2.5	4.5	1.5	2	5.5
Aluminum Smelter Expansion	5.5	2.5	7	1.5	2	3
Oxygen Steel Plant Expansion	2	4.5	4.5	6	5.5	3
Ferrosilicon Smelter	2	1	2	6	5.5	9
Polypropylene Plant	5.5	4.5	2	3.5	5.5	5.5
Hydrofluoric Acids Plant	5.5	7.5	2	3.5	9.5	9
Aluminum Smelter	5.5	6	7	10.5	9.5	1
Alumina Extraction Plant	9	10.5	10.5	8	5.5	3
LNG Import Terminal	9	13	10.5	6	2	9
Ore Mining Development	11.5	10.5	14.5	10.5	9.5	9
Steelworks Modernization	9	7.5	7	10-5	14.5	15
Natural Gas Pipeline System	13	10.5	14.5	13	9.5	9
Offshore Oil Complex	11.5	10.5	12.5	10.5	12.5	13
Petrochemical Complex	14.5	15	9	14	12.5	13
Petroleum Refinery	14.5	14	12.5	15	14.5	13

2. Intercorrelations Among Dimensions

Using the rank order data presented in Table IV.5, we are now able to examine how the dimensions relate to each other. Table IV.6 provides an intercorrelation matrix consisting of nonparametric rank correlation coefficients and their significance levels.

The six dimensions as operationally measured on the fifteen project planning processes are all positively correlated with one another. Only five of the fifteen correlations were found to be "not significant" at the .10 level. The level of inclusiveness appears to be only weakly associated with the levels of continuousness and formalization found in MNC planning. Cases of high inclusiveness were achieved not only by firms that had considered issues all through the planning process, but also by firms which exerted a massive late-stage "catch up" effort. Similarly, low levels of inclusiveness were found not only in those MNCs that had little in the way of formal procedures, but also in those which had quite extensive formal procedures.

With the exceptions of the two weak correlations reviewed above, the rest of the associations are moderately or strongly positive in character. The strongest relationship was observed between professional involvement and systematization, perhaps implying that the involvement of professionals is a necessary condition for the utilization

TABLE IV.6

INTERCORRELATIONS AMONG DIMENSIONS OF ECOLOGICAL INCORPORATION[a)]

	Professional Involvement	Continuousness	Inclusiveness	Public Participation	Formalization
Systematization	.8024*	.4570**	.5340**	.6000*	.3917***
Professional Involvement		.5364**	.6776*	.7244*	.4805**
Continuousness			.2406	.7037*	.5909*
Inclusiveness				.5291**	.1641
Public Participation					.4178***

[a)] Measures of correlation are Kendall rank correlation coefficients (tau), corrected for ties; significance levels: * = .01 level, ** = .05 level, *** = .10 level.

of systematic techniques of environmental analysis. Other especially strong relationships include "professional involvement--public participation," "continuousness--public participation," and "inclusiveness--professional involvement."

3. Creation of Composite Index of Ecological Incorporation

The construct of "ecological incorporation" has been defined as the effective integration of ecological considerations into the succession of activities involved in project planning. We hypothesized that six dimensions were related to this construct. The task now is to see whether these dimensions were found to be measuring approximately the same thing. If these dimensions do in fact "go together," that is, at least indicate a strong quasi-unidimensional core, then they may be appropriately combined to form a summary measure of the construct.

Table IV.7 presents the scores attained by each project by summing the adjusted scores received on the six dimensions. The maximum score attainable was 30, which according to the operationalized measurement system would correspond to "perfect" or full ecological incorporation. The project planning processes are also ranked from the lowest amount of observed incorporation (1) to the highest amount (15).

In deciding whether this summated score could be employed as a composite index, the main concern rested with

TABLE IV.7

SUMMATED SCORES ON SIX DIMENSIONS
OF ECOLOGICAL INCORPORATION

Project	Summated Score (max=30)	Rank (1=low; 15=high)
Polyethylene Plant	8.625	1
Aluminum Smelter Expansion	9.417	2
Oxygen Steel Plant Expansion	10.376	3
Ferrosilicon Smelter	10.542	4
Polypropylene Plant	10.917	5
Hydrofluoric Acids Plant	13.583	6
Aluminum Smelter	13.749	7
Alumina Extraction Plant	15.959	8
LNG Import Terminal	16.458	9
Ore Mining Development	20.499	10
Steelworks Modernization	20.708	11
Natural Gas Pipeline System	21.541	12
Offshore Oil Complex	21.666	13
Petrochemical Complex	24.250	14
Petroleum Refinery	26.834	15

the "internal consistency" in the set of dimensions making up this score. Various kinds of item-analysis procedures were brought to bear on this question. First, we concluded above that the six dimensions, with only a few minor exceptions, were apparently highly correlated with one another.[11]

Second, the six dimensions were all found to be significantly correlated with the total score attained by summing the six equally-weighted items. These correlations, calculated in three alternative ways, are shown in Table IV.8. A fair amount of internal consistency is indicated by these correlations.

Third, a Kendall coefficient of concordance which measures the extent of association among rankings was calculated and tested. The value of the coefficient for the data was found to be .7141, with a probability that a coefficient of this magnitude or larger might have occurred by chance being less than .0001. This high and significant coefficient of concordance can be interpreted as meaning there is strong overall agreement among the six sets of rankings.

Fourth, all of the six component dimensions were found to possess discriminatory power; each of the dimensions by itself differentiates low total scorers from high total scorers. The dimensions of systematization, professional involvement, continuousness, inclusiveness, and public participation all clearly discriminate low from

TABLE IV.8

CORRELATIONS OF DIMENSIONS WITH SUMMATED TOTAL SCORE[a)]

Dimension	Pearson Product-moment Correlation Coefficient[b)]	Spearman Rank Correlation Coefficient[c)]	Kendall Rank Correlation Coefficient[c)]
Professional involvement	.9494*	.9565*	.8900*
Public participation	.9221*	.9168*	.8053*
Systematization	.8925*	.9106*	.7769*
Continuousness	.8084*	.7790*	.6450*
Inclusiveness	.7785*	.7708*	.5707*
Formalization	.6634*	.6712**	.4994**

a) Significance levels: * = .01 level, ** = .05 level

b) Calculated on adjusted scores.

c) Calculated on ranks of adjusted scores.

medium total scorers and both from high total scorers. In other words, the probability is high that the position attained by any MNC project planning process on any of these five dimensions will be closely correlated with its position attained on the total sum of all six dimensions. The dimension of formalization does not clearly discriminate low from medium total scorers, but does differentiate between these two groups and high scorers.

Each of the interrelated checks for internal consistency above indicated a strong degree of homogeneity among the six component dimensions. In short, they appeared to be measuring essentially the same underlying property. From this reasoning, the summated scores presented in Table IV.7 can be considered appropriate composite indices of the ecological incorporation embodied in each of the project planning processes.

4. "Ecological Incorporation" Clusters

A further check on the utility of the composite index as a reliable summary measure of ecological incorporation was performed by running a cluster analysis on the dimensional data. The objective of this analysis was to determine which project planning processes "hung together" in terms of ther "profiles" across the six separate dimensions. The fifteen "profiles" formed by the positioning of the planning processes on the six equally weighted dimensions

were clustered using a hierarchical clustering procedure.[12] Using profile information of level, shape, and dispersion, the clustering program separated the planning processes into groups such that each process was more like other planning processes in its group, than like processes outside the group. The result was the formation of essentially three groups of planning processes with respect to the jointly considered six dimensions. The most prominent distinguishing feature of each group was its overall average level of ecological incorporation (i.e., low total scorers were placed into one group, moderate total scorers in another, and high total scorers in another). These results provided additional evidence supporting the utility of the composite index as a good summary measure of embodied ecological incorporation. The output of the cluster analysis in a hierarchical form appears in Appendix C.

5. Sensitivity of Rank Order to Construction Procedures

To facilitate a better understanding of the relationship between the final rank order of planning processes and the way in which it was constructed, a limited sensitivity analysis was performed. The objective was to determine how possible errors or changes in scoring and index construction would affect the rank order. In short, we have found the rank order of projects to be quite stable

over a considerable range of variation in the nature of its component inputs.

Exhibit IV.1 shows the ranking of projects on the basis of their composite scores. The projects are grouped into the three clusters which emerged from the cluster analysis described above. Some of the project scores within each cluster are rather close, but the gaps between clusters, especially between "moderate" and "high," are fairly large.

The responsiveness of the rank order to changes in index composition was examined in a number of ways. Table IV.9 provides the results of this experimentation. Columns two through seven show the rank orders that result when each of the dimensions, one at a time, is left out of the summary score. As can be seen, the deletion of any one of the dimensions makes very little difference in the resulting rank order. The relative positions of the projects, if they change at all, usually shift up or down only one rank and never shift more than two ranks. All of the shifting that takes place is intra-cluster; no shifting of planning processes among clusters takes place.

Columns eight and nine of Table IV.9 show the rank orders which result when the dimensions that were found to be most weakly correlated with the composite score are deleted. Column eight removes formalization and inclusiveness, and column nine removes these two in addition to continuousness. As the resulting rank orders demonstrate,

EXHIBIT IV.1

ECOLOGICAL INCORPORATION CLUSTERS

	Project	Composite Score	Rank
"Low" ecological incorporation	Polyethylene Plant	8.625	1
	Aluminum Smelter Expansion	9.417	2
	Oxygen Steel Plant Expansion	10.376	3
	Ferrosilicon Smelter	10.542	4
	Polypropylene Plant	10.917	5
"Moderate" ecological incorporation	Hydrofluoric Acids Plant	13.583	6
	Aluminum Smelter	13.749	7
	Alumina Extraction Plant	15.959	8
	LNG Import Terminal	16.458	9
"High" ecological incorporation	Ore Mining Development	20.499	10
	Steelworks Modernization/ Expansion	20.708	11
	Natural Gas Pipeline System	21.541	12
	Offshore Oil Complex	21.666	13
	Petrochemical Complex	24.250	14
	Petroleum Refinery	26.834	15

TABLE IV.9

SENSITIVITY TESTING OF RANK ORDER ON ECOLOGICAL INCORPORATION

Level of Ecological Incorporation	Project	(1) Rank order based on all six dimensions	(2) Rank order w/out professional involvement	(3) Rank order w/out systematization	(4) Rank order w/out inclusiveness	(5) Rank order w/out public participation	(6) Rank order w/out continuousness	(7) Rank order w/out formalization	(8) Rank order w/out formalization & inclusiveness	(9) Rank order w/out formalization, inclusiveness & continuousness	(10) Maximum rank change
Low	Polyethylene Plant	1	1	1	2	1	1	1	1	1	1
	Aluminum Smelter Expansion	2	2	2	1	4	2	3	2	2	2
	Oxygen Steel Plant Expansion	3	4	3	3	2	3	5	4	4	2
	Ferrosilicon Smelter	4	5	5	4	3	4	2	3	3	2
	Polypropylene Plant	5	3	4	5	5	5	4	5	5	2
Moderate	Hydrofluoric Acids Plant	6	6	6	8	7	6	6	6	6	2
	Aluminum Smelter	7	7	7	6	6	7	7	8	7	1
	Alumina Extraction Plant	8	8	9	7	8	8	9	9	10	2
	LNG Import Terminal	9	9	8	9	9	9	8	7	8	2
High	Ore Mining Development	10	10	10	10	10	11	11	10	11.5	1.5
	Steelworks Modernization	11	12	11	13	11	10	10	11	9	2
	Natural Gas Pipeline System	12	11	12	11	12	13	13	13	13	1
	Offshore Oil Complex	13	13	13	12	13	12	12	12	11.5	1.5
	Petrochemical Complex	14	14	14	14	14	14	14	14	14	0
	Petroleum Refinery	15	15	15	15	15	15	15	15	15	0

removing from the composite index the dimensions which might be least related to the underlying concept does not appreciably affect the ranking of planning processes.

Relatively large variations in the composition of dimensions (and thus in their associated indicators) going into the construction of the composite index of ecological incorporation result in only small variations in the rank order of planning processes. The rank order remains remarkably stable largely because of the strong intercorrelations among the dimensions. The practical implication of this finding is that a number of indicators, or even dimensions, which one believes have been imperfectly measured, can easily be removed from the composite index, yet the rank order of projects will remain virtually the same.

6. Validity and Reliability of Composite Index and Construction Procedure

How valid and reliable are the composite index and the procedures by which it was achieved? The degree to which the operational measures of ecological incorporation actually measured what they were designed to measure (i.e., validity) can be guaged only crudely. Each of the twenty-six indicators going into the composite were deemed to possess "face validity," in the sense that in terms of current knowledge each is logically indicative of the concept of ecological incorporation. The composite index, as transformed into the rank order, appears to possess

"concurrent validity." Chapters V through VIII reveal that it correlates strongly in expected ways with a number of theoretically related criterion variables related to project nature, organization, and public policy. Confidence in the validity of the index can also be derived from the finding of "internal consistency" among the various dimensions. The strong agreement among the dimensions implies that a similar underlying property was probably captured by these different measures. Additional confidence was gained by reinterviewing in January 1975 an environmental coordinator associated with one of the lowest scoring planning processes and an environmental coordinator associated with one of the highest scoring planning processes. The vast differences in the extent to which planning behavior had been environmentally-oriented were solidly confirmed by these "reality-testing" interviews.

The reliability, or the degree to which the methods employed reduced measurement error to an acceptable minimum and are replicable by others, can only be inferred by assessing the success of efforts that were designed to control sources of error. The common interview guide employed in gathering the data had been pretested. Multiple interviews were conducted in each MNC in order to spot distortions, discrepancies, and rationalizations. Cross-check interviews were conducted with engineering and construction contractors, environmental consulting firms and

citizen environmental groups. As far as possible, interview data was compared with documentary materials such as project proposals and impact statements, and with secondary materials such as accounts of the project in the news media. Only fifteen of the twenty-one projects investigated were included in the formal data analysis; six were deleted for reasons of incomplete data. Special efforts were made to guard against the "halo effect" in performing the categorization and scoring procedures. One-page summaries on the planning process for each indicator were created. Scores on each indicator were assigned independently of all other indicators. Explicit anchors were attached to all categories of each indicator. Despite these procedures, it is important to recognize the countless judgmental decisions which had to be made in order to convert the mass of raw and heterogeneous qualitative data into the homogeneous quantitative index. It is hoped, however, that the methods and criteria have been explicated sufficiently such that an independent replication would produce the same results.

E. SUMMARY ON THE ROLE OF ECOLOGICAL CONSIDERATIONS

In what manner have ecological considerations been incorporated into MNC project planning? The answer to this question can best be given by summarizing the findings on each of the six dimensions.

Environmental science professionals are frequently involved. Most of the involvement consists of part-time advice and assistance, but occasionally of full-time membership on the planning team on the part of internal environmental engineering staff personnel. For reasons of needed expertise and "credibility," external environmental professionals are frequently brought into the planning process, but usually at a late stage to investigate environmental conditions at the site location.

Some use is made of systematic methods. Systematic residuals discharge monitoring and prestartup baseline surveys, both apparently done for essentially defensive reasons, are quite commonly employed. Systematic preproject environmental impact assessment and post-startup ecological impact monitoring are employed much less frequently, and rather reluctantly, in order to satisfy the planning approval process.

Attention is given only to process pollution. Planning attention is usually focused on issues of process-related residuals discharge, with only shallow attention generally being directed to potential environmental consequences associated with other project actions such as construction and transportation. Attention to pollution control in the selection of process technology is most significant when the project involves a new engineering challenge or unsolved environmental problems. In addition to being primarily

focused on residuals discharge, environmental factors are typically brought into the planning process in a rather fragmentary, compartmentalized fashion. Integrative and holistic environmental impact thinking is rarely found.

Project planning is a closed, nonparticipatory process. MNC project planning is typically secretive, exclusionist, low profile, and "official-channels-only" in character. Participation of potentially-affected publics is rarely solicited. Such efforts are made (if at all) just prior to any formal public hearing, with few exceptions.

Consideration of environment is usually only at a late stage. The incorporation of environmental considerations is discontinuous in nature, coming largely at very late stages in the planning process. Most site location ecological baseline research, for example, is done only after approval has been received, preliminary construction activity has already begun, and the range of choice has been narrowed to a single favored project design. Project design choices are principally guided by the "pool of environmental knowledge" accumulated by the MNCs in similar prior project planning experience and in previous environmental research and remedial efforts carried out at similar existing facilities. MNCs appear averse to building into their planning processes the time necessary for thorough pre-project on-site environmental research.

The process if formalized on the matter of environmental spending. Many MNCs have established formal rules and procedures for considering environmental factors during planning, but these largely relate to pollution control expenditure considerations and late-stage environmental staff office project reviews. MNC top managements rarely review the environmental aspects of a proposed project separately, but generally consider these matters, if at all, in the context of the regular capital appropriation and review procedure.

To what extent have ecological considerations been incorporated into MNC project planning? As categorized and measured by the operationalized, multidimensional construct of ecological incorporation, the following conclusions were reached. There is currently a broad range of behavior among MNCs. At one end of the spectrum are some firms which appear to be sensitively and comprehensively taking environmental considerations and values into account. At the other end are many more which are apparently indifferent to environmental concerns, and in their planning are considering little more than the immediate economic and technical aspects of the project. The bulk of MNC behavior, as observed in this study, is bunched towards the latter end of the spectrum and can be described as "unecological."

FOOTNOTES

CHAPTER IV

[1]There remains, however, the question of how much of this environmental research was actually applied in the final result. Some charge that not much really changed during the four-year delay when the bulk of the environmental research was carried out. See: W. R. Derrick Sewell, "Alaska Pipeline Regardless of Costs," The Geographic Magazine, 46 (May, 1974), pp. 385-387; Bryan Sage, "Pipelines Across Alaska," New Scientist, 62 (April 4, 1974), pp. 10-12; Jim Kowalsky, "Pipeline No Showcase Project Despite All Promises and PR," Not Man Apart, 4 (Aug., 1974), pp. 5 & 10; and Richard Corrigan, "Alaska Embarks on its Biggest Boom as Oil Pipeline Gets Under Way," Smithsonian, 5 (Oct. 1974), pp. 38-49.

[2]"Alaska: Closer to Cashing Oil's Riches," Business Week (March 25, 1972), pp. 78-83.

[3]"The New England Oil Rush," Business Week (March 9, 1974), p. 130. (Note: the effort has proven to be relatively successful--it is the only oil company that has been able to convince a New England town that a refinery would be a beneficial addition to the area. The residents of Sanford voted to approve a favorable rezoning change for Gibbs, but recently a citizen's group called "Friends of Intelligent Land Use" (FOIL) filed suit to block construction of the refinery. See: "Suite May Foil Refinery," Chemical Week (Aug. 14, 1974), p. 16.

[4]For one review of the problems see: Thomas G. Dickert and Jens C. Sorenson, "Some Suggestions on the Content and Organization of Environmental Impact Statements," in Thomas G. Dickert with Katherine R. Domeny, eds., Environmental Impact Assessment: Guidelines and Commentary (Berkeley: University Extension, University of California, 1974), pp. 35-53.

[5]Richard N. L. Andrews, "A Philosophy of Environmental Impact Assessment," Journal of Soil and Water Conservation, 28 (Sept.-Oct., 1974), p. 199.

[6]Thomas N. Gladwin and John G. Welles, "Environmental Policy and Multinational Corporate Strategy" (paper presented at the Ford Foundation Symposium on the International Economic Dimensions of Environmental Management, New York, April 17, 1975).

[7]"The New England Oil Rush," Business Week (March 9, 1974), p. 130.

[8]See: Sanford Labovitz, "Some Observations on Measurement and Statistics," Social Forces, 46 (Dec., 1967), pp. 151-160.

[9]Ibid.

[10]Sanford Labovitz, "The Assignment of Numbers to Rank Order Categories," American Sociological Review, 55 (June, 1970), pp. 515-524.

[11]This evidence should be interpreted with caution, however, as different indicators of the same construct need not be highly associated with one another. Different indicators may explain different portions of the variance in the construct, but have little common variance. See John L. Sullivan, "Multiple Indicators and Complex Causal Models," in Hubert M. Blalock, Jr., ed., Causal Models in the Social Sciences (New York: Aldine, 1971), pp. 333-334.

[12]A Euclidean distance proximity measure and minimum variance clustering algorithm were employed. For a discussion of this type of cluster analysis see: Michael R. Anderberg, Cluster Analysis for Applications (New York: Academic Press, 1973).

CHAPTER V

THE INFLUENCE OF PROJECT NATURE

A. INTRODUCTION

The focus in this chapter is on the relationships between the "state" (i.e., manner and extent) of ecological incorporation embodied in the project planning process and the nature of the project being planned. The project nature influence system is viewed as consisting of five variables: project type, project cost, project year, site location type, and project ownership. In this chapter these variables are examined individually, in combination as a system, and in relation to variables contained in the other two influence systems of organization and public policy.

Three of the variables in the project nature system--project cost, project type, and site location type--have been found to be closely related with innovative ecological incorporation behavior. All three appear to exert motivational influence by means of creating the "need" for such behavior. The level of ecological incorporation has not been found to be closely related to the variables of project year or project ownership. Project year appears to have meaning only when viewed in a micro sense, such as in one

MNC or one nation; a general time trend across all surveyed MNCs and nations was not evident in this study. With regard to project ownership it was found that both wholly-owned and joint-venture arrangements possess associated advantages and disadvantages in facilitating environmentally innovative planning behavior.

The project nature system was found to be an interactive one, both within itself and in relation to the other contextual influence systems examined in this study. The project nature variables of cost, type, and site location are highly interrelated, causing individual correlations with ecological incorporation to be partially spurious. At a broader systems level, it appears that the nature of the project is a key determinant of certain public policy variables. The intensity of project-related public pressures and the amount of public project examination appear to depend critically on the type, cost, and year of the project.

B. THE PROJECT NATURE VARIABLES

1. Correlations with Dimensions and Composite Index of Ecological Incorporation

Table V.1 provides a matrix of zero-order rank correlations between the project nature variables and the six dimensions and the composite index of ecological incorporation. Project type and project cost are significantly and strongly positively correlated with ecological incorporation;

TABLE V.1

PROJECT NATURE--ECOLOGICAL INCORPORATION CORRELATIONS[a)]

	Project Type	Project Cost	Project Year	Site Location Type	Project Ownership
Systematization	.4508**	.6375*	-.1523	.3722***	-.1352
Professional involvement	.5788*	.7673*	-.1229	.4181***	.0505
Continuousness	.4473**	.4161**	-.0455	.2187	.0770
Inclusiveness	.6571*	.7710*	-.1750	.3508	.0741
Public participation	.6492*	.6643*	-.0660	.3996***	-.0124
Formalization	.3649	.2913	-.0227	.2430	-.1412
Ecological incorporation composite index	.5820*	.6952*	-.1040	.3892***	-.0587

a) Kendall Rank Correlation Coefficients (tau); significance levels: * = .01 level, ** = .05 level, *** = .10 level.

site location type is mildly positively correlated, and project year and project ownership are slightly negatively associated with ecological incorporation. None of the variables in the project nature system appear to be closely related to the dimension of formalization.

2. Project Type

On the basis of crude indicators, this study has confirmed the hypothesis of "the greater the relative severity and range of potential adverse environmental impacts associated with the type of project, the greater will be the ecological incorporation embodied in the project planning process." The rank correlation coefficient of project type and ecological incorporation is .5820 and is one of the strongest associations discovered in the entire study.

Gauging the relative severity of potential environmental impacts associated with any given industrial project is an extremely complicated task. As was discussed in Chapter II, the magnitude and significance of project-induced environmental consequences depend on the complex, stochastic interaction of a large number of social, economic, technical, physical, chemical, and biological factors. Only a crude assessment was feasible in this study. Using a knowledge of the scale, causative actions, residuals discharge characteristics, and site location features of

each project, judgments were made as to the relative severity of potential adverse impacts on three environmental resources: air, water, and land. The potential for significant damage to each resource from each of the projects was judged to be either relatively low (0), medium (.5), or high (1). An overall crude index of potential damage was created by summating the scores attained on the three individual resources. The results of this exercise appear in Table V.2. The ranks attained on this damage index were then correlated with the ranks attained on the composite index of ecological incorporation in order to test the hypothesis.

The reader is referred to the literature for extensive discussions of the environmental impact problems associated with chemical and petrochemical plants,[1] petroleum refineries,[2] nonferrous metals smelters,[3] iron and steel plants,[4] natural gas and oil pipelines,[5] offshore oil complexes,[6] LNG import terminals,[7] and mining developments.[8] The potential damage index created in Table V.2 reflects both the relative severity and range of associated environmental impacts. Those projects receiving low total scores were generally the small-scale chemical plant projects involving mainly problems of airborne emissions. The projects receiving medium range total scores were typically the metals projects discharging both waterborne and airborne residuals. The projects receiving the high total scores

TABLE V.2

RELATIVE SEVERITY OF POTENTIAL PROJECT ASSOCIATED ENVIRONMENTAL IMPACTS

Projects	Air Quality Damage		Water Quality Damage		Land Quality Damage		Damage Index	Damage Rank	EIR*
Polyethylene plant	medium	(.5)	low	(0)	low	(0)	.5	1.5	1
Aluminum smelter expansion	high	(1)	medium	(.5)	low	(0)	1.5	7.5	2
Oxygen steel plant expansion	high	(1)	medium	(.5)	low	(0)	1.5	7.5	3
Ferrosilicon smelter	high	(1)	medium	(.5)	low	(0)	1.5	7.5	4
Polypropylene plant	medium	(.5)	low	(0)	low	(0)	.5	1.5	5
Hydrofluoric acids plant	high	(1)	low	(0)	low	(0)	1.0	3.5	6
Aluminum smelter	high	(1)	medium	(.5)	low	(0)	1.5	7.5	7
Alumina extraction plant	medium	(.5)	low	(0)	medium	(.5)	1.0	3.5	8
LNG import terminal	medium	(.5)	high	(1)	low	(0)	1.5	7.5	9
Ore mining development	medium	(.5)	high	(1)	high	(1)	2.5	15.0	10
Steelworks modernization	high	(1)	medium	(.5)	low	(0)	1.5	7.5	11
Natural gas pipeline system	low	(0)	high	(1)	high	(1)	2.0	12.5	12
Offshore oil complex	low	(0)	high	(1)	high	(1)	2.0	12.5	13
Petrochemical complex	high	(1)	high	(1)	low	(0)	2.0	12.5	14
Petroleum refinery	high	(1)	high	(1)	low	(0)	2.0	12.5	15

*EIR = Ecological Incorporation Rank

were generally the large-scale projects, such as the ore mine, offshore oil complex, and natural gas pipeline, in which the associated project actions could potentially have severe and/or wide ranging effects on all three receiving media.

The finding of a high positive association between project type and ecological incorporation would imply that the greater the need for consideration of environmental consequences, as determined by the package of associated causative actions, the greater the actual incorporation of environmental factors into project planning will generally be. In dimensional terms, project type appears to be associated most strongly with the levels of inclusiveness, public participation, and professional involvement found in project planning. That is, the involvement of multidisciplinary internal and external professionals will generally be greater, the expenditure of efforts to attain the views of affected publics will generally be fuller, and the scope of considerations evaluated during planning will generally be more comprehensive, the broader the range and/or the more severe the potential environmental impacts associated with the given project.

3. Project Cost

Of all the contextual variables examined in this study, the one which correlates most strongly on a zero-order

basis with ecological incorporation is that of project cost. The rank correlation between the total cost of the project and the extent of overall ecological incorporation embodied in the project planning process is .6952 and is significant at the .01 level.

The projects ranged in cost from $3.5 million to $5.5 billion. The median project cost was $160 million; six projects had costs of less than $100 million, and two had costs of over $1 billion. In general, the lowest cost projects consisted of the small-scale chemical plants and expansions of metals plants. The highest cost projects were generally those related to gas and petroleum ventures (e.g., refinery, petrochemical complex, offshore oil complex, and natural pipeline system).

Project cost was found to be significantly directly related at the .05 level or better with five dimensions of ecological incorporation. The strongest positive associations were found to be with inclusiveness and professional involvement. As with other project nature variables, project cost was found to be only weakly positively associated with formalization.

It was discovered during the interviews with project managers that the potential of serious project delay or even termination because of environmental objections (in the form of lawsuits or blocked planning permissions) is viewed as a risk factor in project planning. This view was

especially prevalent in the case of those large-scale projects that were perceived to be extremely consequential to the firm (i.e., for reasons of competitive pressure, massive sunk planning costs, and/or tremendous required resource commitment). Ecological incorporation in the planning of these kinds of projects may thus represent an effort to reduce the firm's exposure to risk. "We were willing to do almost anything in the environmental area in order to get that approval," said one petroleum project manager.

Greater project cost was also seen to be associated with greater top management attention in many of the firms. This was especially true in the case of the six projects costing over $250 million. In all of those projects the firms' top managements took an especially active interest in the environmental path of the project planning process. With greater top management attention one would expect greater efforts on the part of project planners to make sure the project is consistent with corporate environmental management policies and to make sure that the project is not blocked or delayed by environmentalist objections. Finally, it appears that ecological incorporation is facilitated by the larger planning budgets associated with higher cost projects. More "slack" funds for environmental planning use are usually contained in the planning budgets of large cost, as compared to small cost projects.

4. Project Year

This study did not find the year of the project to be significantly associated with the level of ecological incorporation. Rather than finding a positive correlation as hypothesized, a small negative association of .1040 was discovered. The year chosen for correlation purposes was the year in which the planning activity was most intensive for each of the projects. As shown in Table V.3, this year ranged from 1967 through 1974, with the median year being 1972.

The reasons for not finding a significant association are probably twofold. First, the character of the projects planned during the early and later years differed markedly. The projects planned in the period of 1967 through 1971 included mostly large cost, "grass roots" projects, while those planned in 1973 and 1974 included many of the small cost, "expansion" type projects. Second, the influence of project year apparently must be viewed in a perspective relative to the state of environmental policy in the host nation. Some of the earliest projects in this study took place in nations where issues of environmental protection had been politicized the earliest, while some of the later projects were located in nations just beginning to consider environmental issues. In sum, some of the highest cost, largest scale projects took place in environmentally progressive nations during the early years, while

TABLE V.3

TIMING ASPECTS OF PROJECTS

Projects	Ecological Incorporation Rank	Year in Which Planning Activity Was Most Extensive	Years from Start of Planning to Start of Construction	Years from Start of Planning to Start of "On Stream" Operations
Polyethylene plant	1	1970	2	4
Aluminum smelter expansion	2	1973	4	6
Oxygen steel plant expansion	3	1974	4	6
Ferrosilicon smelter	4	1974	2	4
Polypropylene plant	5	1972	2	4
Hydrofluoric acids plant	6	1972	2	4
Aluminum smelter	7	1967	2	6
Alumina extraction plant	8	1973	4	7
LNG import terminal	9	1971	7	11
Ore mining development	10	1969	3	9
Steelworks modernization	11	1973	3	4
Natural gas pipeline system	12	1973	6	9
Offshore oil complex	13	1971	3	5
Petrochemical complex	14	1972	4	7
Petroleum refinery	15	1972	2	4

some of the lowest cost, smallest scale projects were carried out in environmentally sluggish nations during the later years. These contaminating factors, which are apparently more crucial in determining ecological incorporation, caused the association between project year and ecological incorporation to be slightly negative in character.

The influence of project year was more apparent in those five MNCs in which multiple projects were investigated. In every one of these firms, the projects occurring most recently were found to possess more ecological incorporation than the earlier projects. Organizational learning within the firm over time with regard to environmentally-oriented project planning behavior does seem to be occurring.

Another temporal aspect of interest is the length of the planning period. Table V.3 provides data on the length of the project planning periods in terms of the number of years from beginning to construction and "on stream" operations. Downs has found the process of search to be greatly affected by the time pressure associated with a given decision:

> . . . there is an inverse relationship between the extension of search and the time pressure on the decision. Whenever time pressure is high, the following will occur: --A minimal number of alternatives will be considered . . . whenever only a few alternatives are considered, all the biases influencing the order in which possible alternatives are formulated become accentuated... The decision makers involved will try to restrict the number of persons participating in the decision and the diversity of views among them.[9]

From this reasoning one might expect the level of ecological incorporation to be lower, the higher the time pressure (or as an indicator the shorter the planning period). This study found a rank correlation coefficient of .2060 between length of the planning period (start of planning to start of construction) and the level of ecological incorporation. Although this coefficient was not found to be significant, the planning period did have higher correlations with the dimensions of inclusiveness (.4104, significant at the .06 level) and systematization (.3515, significant at the .11 level). Thus the utilization of time-consuming systematic, analytical methods and the comprehensiveness with which environmental factors are considered both may be sensitive to the amount of time available for project planning. Length of the planning period was found to be positively correlated with project cost (.3795, significant at .10 level) and averaged 4.5 years for the gas/oil projects, 3.3 years for the metals projects, and 2.4 years for the chemicals projects.

5. Site Location Type

This study has confirmed the hypothesis that the greater the extent to which the site location of the project is currently nonindustrial in character, the greater will be the ecological incorporation embodied in the project planning process. A rank correlation coefficient of .3892

(significant at the .07 level) was discovered between site location type and ecological incorporation.

The fifteen projects were ranked on a continuum of site location "nonindustrialization." Three projects were expansions at a site where the firm already had existing facilities, one project was sited in a governmentally prescribed heavy industrial zone, five projects were located in areas with neighboring industry, and six projects were sited in "virgin" territory with no previous existing industry. With a few exceptions, the level of ecological incorporation was generally the lowest when the project involved an expansion at a current existing industrial site, and was generally the highest when the project was placed in countryside areas previously untouched by heavy industry.

Site location type was found to be most closely associated with the dimensions of professional involvement, public participation, and systematization. This implies that efforts to inform and involve affected publics may be more necessary in cases where the project represents an industrial intrusion on a previously non-industrial way of life. It probably also indicates the lack of cumulative knowledge of site location ecosystem characteristics. The involvement of environmental science professionals utilizing systematic methods to gather information on baseline conditions is apparently more necessary when the project is being located in an "unknown" nonindustrial site location.

6. Project Ownership

The extent of project ownership was not found to be significantly positively related to the level of ecological incorporation embodied in the project planning process. A rank correlation coefficient of -.0587 was discovered. It appears that both wholly-owned and joint-venture arrangements possess advantages and disadvantages with regard to environmentally oriented project planning. Whether the costs outweigh the benefits or vice-versa seems to depend on the individual project situation.

Of the fifteen projects investigated, nine were wholly-owned. Of the six involving project partners, only two were minority joint ventures (i.e., where the firm interviewed owned less than 50% of the project). The mix of partners involved in the projects varied considerably: two of the projects involved other "foreign" industrial partners, two involved "local" industrial partners, and two involved local government agency partners. Joint-venture arrangements occurred in two basic situations: either divided local ownership was prescribed by national law or the joint ventures were created for purposes of sharing the massive costs and risks associated with developing the project.

In a few cases the contributions of partners appeared to outweigh the dilution of control over environmental protection project planning decisions. In one

project the firm had explicity turned to a minority partner for its previous similar project planning experience in the area of safety and environmental protection matters. In another, the local minority partners were apparently able to contribute a knowledge of local politics and customs in the area of environmental concerns. In the projects involving local governmental agency partners the project planners were able to obtain governmental views and permissions much more easily.

In only two cases was the joint-venture arrangement disadvantageous for ecological incorporation. The project managers made it known in both cases that problems of communications, delays, and compromises had at least partially adversely affected (i.e., slowed down the research program, necessitated a cut in planned environmental control expenditures, etc.) the process of ecological incorporation.

The assumption that greater sole ownership is more conducive to effective ecological incorporation must be questioned. Four of the five lowest ecological incorporation scores were attained by wholly-owned projects, as were three of the five highest scoring projects. Ecological incorporation may be greatly facilitated by the more "open" planning process involved in, and the synergistic pooling of experience made possible by, divided ownership ventures. The control and communications advantages of wholly-owned project planning may be outweighed when the firms do not

possess adequate resources and motivation for ecological incorporation.

C. THE PROJECT NATURE SYSTEM

1. Project Nature Variables in Combination

Table V.4 provides an intercorrelation matrix of the project nature variables. Three correlations are significant (at least at the .10 level) and must be examined in order to clarify the relationships observed between project nature and ecological incorporation. The three associations of interest are: 1) project type--project cost, 2) project cost--site location type, and 3) site location type--project ownership.

Table V.4 shows that the cost of a project is strongly positively correlated with both the relative severity and range of environmental impacts associated with the type of project and with the extent to which the site location of the project is currently non-industrial in character. It also shows that site location character is strongly inversely related to project ownership. Given these close associations, the question becomes whether the individual correlations between the project nature variables and ecological incorporation are genuine or spurious. Partial correlation analysis is employed below to help sort out these questions.

TABLE V.4

INTERCORRELATIONS AMONG PROJECT NATURE VARIABLES[a)]

	Project Cost	Project Year	Site Location Type	Project Ownership
Project type	.6466*	-.0824	.3650	.0000
Project cost		-.0416	.4560**	-.0822
Project year			-.1336	-.2310
Site location type				-.4390***

a) Kendall Rank Correlation Coefficients (tau); significance levels: * = .01 level, ** = .05 level, *** = .10 level.

Table V.5 provides first-order partial correlation information. The original zero-order correlations between the project nature variables and ecological incorporation have been controlled for the influence of project type, project cost, and site location type one at a time. As revealed in this table, the association between project type and ecological incorporation remains strong when project cost and site location type are both held constant, which suggests that this is probably a genuine independent relationship. When the relationship between project cost and ecological incorporation is controlled for project type, however, there is a moderate reduction in the strength of the correlation (from .5993 to .3813). Project type appears to be an intervening variable. Higher cost implies a broader range of potentially severe impacts, which in turn typically necessitates more ecological incorporation.

When the association between site location type and ecological incorporation is controlled for project cost, there is a significant reduction in the strength of the correlation (from .3963 to .1551). This is indicative of partial spuriousness, since the association between site location type and ecological incorporation probably results from the joint causal effect of project cost on both variables.

Table V.5 also suggests that the relationships between project year and project ownership with ecological

TABLE V.5

PROJECT NATURE PARTIAL CORRELATION ANALYSIS[a)]

	Zero-order Correlation with Ecological Incorporation	Project Type	Project Cost	Site Location Type
Project type	.6692	--	.5642	.6672
Project cost	.5993	.3813	--	.5080
Project year	-.1004	.0159	-.0036	.0267
Site location type	.3963	.2917	.1551	--
Project ownership	.0859	.0402	-.0016	.3310

[a)] These are Pearson product-moment zero-order and first-order partial correlation coefficients.

incorporation are partly suppressed by the influence of other project nature variables. The slightly negative correlation of project year with ecological incorporation vanishes when other project system variables are controlled. In a similar fashion, the association between project ownership and ecological incorporation substantially strengthens when the type of site location is controlled. This happens because ownership is negatively related to site location type, which in turn is positively related to incorporation. This effect was caused because most of the expansions at existing sites were wholly-owned, while many of the "virgin" territory projects were joint ventures. With the masking influence of site location removed, it appears that increasing project ownership may indeed be moderately related to increasing levels of ecological incorporation.

In sum, the above examination of the interrelationships between the variables in the project nature system has revealed that project type appears to exert a strong independent influence. Project cost also exerts a strong influence, both directly and indirectly through its effect on project type. The correlation of site location type with ecological incorporation is partly spurious, being a joint effect caused by variation in project cost. Finally, the influence of project year and project ownership is very weak, even when the influence of suppressor variables are removed.

2. Project Nature Variables in Relation to Organization and Public Policy

There are a few critical relationships among project nature variables and organizational and public policy variables which also need to be examined. Table V.6 provides a matrix of intercorrelations between the five project nature variables and the eight variables of the organizational system and the five variables of the public policy system. Only nine rank correlations out of the 65 contained in the matrix are significant at the .10 level or better, which on the surface seems to imply that the three influence systems may be relatively independent of each other. An inspection of the significant associations, however, reveals that the project nature system is relatively independent of the organizational system, but apparently inextricably related to the public policy system.

A few associations relating to the organizational system are worth noting. Those MNCs undertaking projects with a broad range of potentially severe environmental impacts are often the ones in which objectives for environmentally reponsible behavior have been made formally explicit, expressed in leadership terms, applied globally, and backed by frequent illustrations of top management support. Those firms siting projects in non-industrial locations tend to be relatively more profitable and investment intensive, and to have assigned personnel more fully to

TABLE V.6

INTERCORRELATIONS OF PROJECT NATURE VARIABLES WITH ORGANIZATIONAL AND PUBLIC POLICY VARIABLES[a)]

	Project Type	Project Cost	Project Year	Site Location Type	Project Ownership
Organizational System:					
EC objectives & top mgt. commitment	.4030***	.3256	-.1556	.3564	-.2761
EC role assignment	.1862	.2263	-.5056**	.4084***	-.1015
EC performance measurement	-.0736	-.0108	-.0118	.2406	-.2541
EC research & technology programs	-.1658	.0338	-.3323	.3553	-.1807
EC external surveillance and interaction	.3259	.1852	-.3034	.2042	-.0508
Company profitability	.1312	.0966	-.3483	.4175***	-.2503
Company size	.0875	.1353	-.2005	.2144	-.3218
Company investment intensiveness	.2483	.1353	-.2639	.3272	-.1788
Public Policy System:					
Home country environmental policy	.2603	.0460	.0377	.2015	-.3831
Host country environmental policy	.3313	.1366	-.0959	-.2621	.4454*
Public project examination	.2530	.5111**	.0814	.0870	-.1314
Project associated public pressures	.4373**	.6044*	.0974	.1273	.0000
Environmental conflict experience	.5091**	.2825	.1143	.1833	-.1807

[a)] Kendall Rank Correlation Coefficients (tau); significance levels: * = .01 level, ** = .05 level, *** = .10 level.

environmental control roles. Finally, the inverse relationship between project year and environmental control role assignment (as well as all of the other variables in the organizational system) is quite revealing. This implies that some of the firms in this study which were planning the latest investments generally had the least developed internal environmental management structures.

The interrelationships among project nature variables and external public policy variables are more plentiful, and as judged in partial correlation terms below, are also more important in determining the role of individual project nature variables. Those MNCs executing "high" environmental impact type projects were typically those that had experienced the greatest amount of prior external conflict on issues of environmental protection and which encountered the most intense public demands and resistance during the current project. More intense public pressures were also strongly associated with higher cost projects, as were public examination requirements such as hearings, permits, and impact statements. Finally, wholly-owned projects tended to be located in host nations with more progressive national environmental policies.

Interactions among variables in the project nature system with variables in the other two systems are best illustrated by means of partial correlation analysis. Table V.7 examines the associations between the five project

TABLE V.7

PROJECT NATURE WITH ECOLOGICAL INCORPORATION PARTIALED ON GROUPS OF ORGANIZATIONAL AND PUBLIC POLICY VARIABLES[a)]

		Second-order or Third-order Partial Correlations with Ecological Incorporation Controlled for:		
	Zero-order Correlation with Ecological Incorporation	Company Profitability, Company Size, & Company Investment Intensiveness[b)]	EC Objectives & Top Mgt. Commitment, EC Role Assignment & EC External Surveillance & Interaction[b)]	Public Project Examination & Project Associated Public Pressures[c)]
Project type	.6692	.6074	.6293	.5522
Project cost	.5993	.5310	.7973	.5322
Project year	-.1004	-.1456	-.0659	-.2243
Site location type	.3963	.5417	.2434	.5415
Project ownership	.0859	-.0394	.3012	-.2571

[a)] Pearson product moment zero-order, second-order and third-order partial correlation coefficients.

[b)] Third-order partials.

[c)] Second-order partials.

nature variables and ecological incorporation when statistical efforts are made to control for three groups of the most "powerful" organizational and public policy variables. When company demographics (i.e., profitability, size, and investment intensiveness) are held constant, there is very little difference between the third-order partial correlation coefficients and the initial zero-order coefficients, which implies that the associations between project nature variables and ecological incorporation are independent of the influence of these three characteristics when considered simultaneously. Likewise, when corporate environmental management structures are held constant (i.e., EC objectives and top management commitment, role assignment, and external surveillance and interaction) no major reductions in correlation coefficients occur. Since the correlations remain strong, one may cautiously conclude that the influence of project nature on ecological incorporation is for the most part independent of the influence of organizational characteristics.

The above independence conclusion cannot be reached, however, with regard to the public policy variables. With the exception of site location type, the second-order partials are all lower than the original correlations attained between the project nature variables and ecological incorporation. These reduced partials suggest that public project examination and project associated public pressures

are intervening variables between project nature and ecological incorporation. Project type, cost, year, and ownership all appear to lead to more intense public pressure and closer public scrutiny, and both of these factors, in turn, appear to require greater ecological incorporation. A fuller discussion of the role of project nature variables in determining public reaction in the host country is contained in Chapter VII.

D. SUMMARY ON THE INFLUENCE OF PROJECT NATURE

After subjecting the five project nature variables to correlation and partial correlation analysis, it appears that the variables of project type and project cost are strongly related, and the variable of site location type is mildly related, to the level of ecological incorporation. These three variables appear to share a common thread; that is, each in its own way creates a "need" for environmentally-oriented planning behavior. Project type (i.e., relative severity and range of potential adverse environmental impacts) does this by creating the essential reason for integrating environmental concerns into planning. Increasing project cost seems to generate greater top management attention to the environmental path of the planning process, to provide more facilitating "slack" in the project planning budget, and to motivate ecological incorporation for risk reduction purposes (i.e., avoidance of delays and

terminations). Finally, less environmental information is generally available and perceived public resistance is typically higher when the project involves a site location previously untouched by heavy industry. The need for procuring the necessary information and for taking advance action to appease the expected resistance may thus be correspondingly higher in such cases. The variables of project year and project ownership show no clear systematic relationship with ecological incorporation.

The influence of variables in the project nature system appears to be independent from organizational variables, but closely intertwined with public policy variables in the host country. The completeness of public examination and the intensity of public resistance appear to depend, in part, on the scale of the project, the range of associated adverse impacts associated with the project, and the year in which the project was planned.

FOOTNOTES

CHAPTER V

[1]See: H. R. Jones, Environmental Control in the Inorganic Chemical Industry (Park Ridge, N. J.: Noyes Data Corp., 1972); H. R. Jones, Environmental Control in the Organic and Petrochemical Industries (Park Ridge, N. J.: Noyes Data Corp., 1971); and Emmit F. Spencer, Jr., "Pollution Control in the Chemical Industry," in Herbert F. Lund, ed., Industrial Pollution Control Handbook (New York: McGraw-Hill, 1971), Chap. 14.

[2]See: Clifford S. Russell, Residuals Management in Industry: A Case Study of Petroleum Refining (Baltimore: Johns Hopkins University Press for Resources for the Future, Inc., 1973).

[3]See: H. R. Jones, Pollution Control in the Nonferrous Metal Industries (Park Ridge, N. J.: Noyes Data Corp., 1972).

[4]See: Frank N. Kemmer, "Pollution Control in the Steel Industry," in Herbert F. Lund, ed., Industrial Pollution Control Handbook (New York: McGraw-Hill, 1971), Chap. 10; and Clifford S. Russel and William J. Vaughan, "A Linear Programming Model of Residuals Management for Integrated Iron and Steel Production," Journal of Environmental Economics and Management, 1 (May 1974), pp. 17-42.

[5]See: Charles J. Cicchetti, Alaskan Oil: Alternative Routes and Markets (Baltimore: Johns Hopkins University Press for Resources for the Future, Inc., 1972), and Judith Maxwell, Energy from the Arctic: Facts and Issues (Washington: National Planning Association for the Canadian-American Committee, 1973).

[6]See: Norman Sanders, "North Sea Oil: Can the Technology Cope?" New Scientist, 56 (Nov. 16, 1972), pp. 380-382, and "Designing Offshore Rigs," Petroleum Press Service (March, 1971), pp. 92-95.

[7]See: Robert J. Bolan, "Safety and Design Priorities for LNG Import Terminals," Pipeline and Gas Journal, 201 (June 1974), pp. 46-56.

[8]See: Raul A. Deju, ed., Extraction of Minerals and Energy: Today's Dilemmas (Ann Arbor, Mich.: Ann Arbor Science, 1974).

[9]Anthony Downs, Inside Bureaucracy (Boston: Little, Brown and Co., 1967), p. 183.

THE ROLE OF ECOLOGICAL CONSIDERATIONS IN THE MULTINATIONAL CORPORATE PROJECT PLANNING PROCESS: A COMPARATIVE STUDY OF NORTH AMERICAN- AND WESTERN EUROPEAN-BASED PETROLEUM, CHEMICALS AND METALS FIRMS

Volume II

by

Thomas Neil Gladwin

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Doctoral Committee:

Professor Vern Terpstra, Chairman
Professor Robert W. Adams
Assistant Professor Richard N. L. Andrews
Associate Professor Raymond E. Hill
Faculty Member Arie de Koning, Centre d'Etudes Industrielles, Geneva, Switzerland

CHAPTER VI

THE INFLUENCE OF ORGANIZATION

A. INTRODUCTION

The focus in this chapter shifts to relationships between environmentally-oriented project planning behavior and organizational characteristics of the firm doing the planning. The organizational influence system is conceived as consisting of eight variables: 1) environmental control (EC) objectives and top management commitment, 2) EC role assignment, 3) EC performance measurement, 4) EC research and technology programs, 5) EC external surveillance and interaction, 6) company profitability, 7) company size, and 8) company investment intensiveness. These variables are viewed as key components of the structural system within which project planning is carried out. The variables are examined individually, in combination as an interactive system, and in relation to the other two contextual systems of project nature and public policy.

Five of the eight organizational variables have been found to be at least mildly important in the explanation of ecological incorporation behavior. Two of the EC-related variables--objectives and external surveillance--

appear to exert direct and moderate influence. Deep-seated corporate objectives of environmentally-responsible behavior provide planners with clear and powerful guidance. Greater exposure to the views of external groups on environmental protection, as achieved by extensive scanning and interorganizational interaction, greatly facilitates environmentally-oriented planning by increasing the firm's sensitivity and knowledge base. The three variables related to the MNC's financial or economic character--profitability, investment intensiveness, and size--all appear to be mildly, but primarily indirectly related to ecological incorporation. High profitability seems to generate facilitating "slack." Large size and large capital expenditure programs appear to enable the firm to reap the benefits of greater specialization in the assembly of skills and resources required for ecological incorporation. These three "economic character" variables, in combination with past exposure to progressive home nation environmental policy and conflict, have been found to be important in determining a MNC's "environmental management structure" (i.e., its highly interdependent system of five EC-related variables).

B. THE ORGANIZATIONAL VARIABLES

1. Correlations with Dimensions and Composite Index of Ecological Incorporation

Table VI.1 presents a matrix of zero-order rank correlations between the eight organizational variables,

TABLE VI.1

ORGANIZATION--ECOLOGICAL INCORPORATION CORRELATIONS[a)]

	EC Objectives & Top Management Commitment	EC Role Assignment	EC Performance Measurement	EC Research & Technology Programs
Systematization	.5214**	.3335	.1474	.1768
Professional involvement	.5246**	.3204	.1281	.1332
Continuousness	.3890***	.2922	.4146***	.0492
Inclusiveness	.2032	.1947	-.2622	-.0711
Public participation	.3441	.1522	.1719	.0476
Formalization	.4223***	.4382**	.2843	.1477
Ecological incorporation composite index	.5087**	.3086	.1627	.1014

continued--

TABLE VI.1--continued

	EC External Surveillance & Interaction	Company Profitability	Company Size	Company Investment Intensiveness
Systematization	.4411**	.2526	.2729	.3335
Professional involvement	.4862**	.2284	.2284	.3944**
Continuousness	.4944**	.1794	.2850	.4539**
Inclusiveness	.2596	.0406	.1016	.1422
Public participation	.3588**	.0715	.1940	.2962
Formalization	.6293*	.3061	.4116***	.5594*
Ecological incorporation composite index	.4938**	.1933	.2706	.4252**

a) Kendall Rank Correlation Coefficients (tau); significance levels: * = .01 level, ** = .05 level, *** = .10 level.

and the six dimensions and composite index of ecological incorporation. Two of the variables--EC objectives and top management commitment, and EC external surveillance and interaction--are strongly and significantly positively correlated with ecological incorporation. Company investment intensiveness is moderately positively correlated and company size and EC role assignment are mildly directly, but not significantly, associated. Company profitability, EC performance measurement, and EC research and technology programs show only slight positive and insignificant correlations with the composite index of ecological incorporation. From Table VI.1 it appears that organization is largely unrelated to the dimension of inclusiveness and only weakly associated with the dimension of public participation. The close associations between organization and ecological incorporation appear to be operating primarily via the other four dimensions.

2. Environmental Control Objectives and Top Management Commitment

The organizational variable which shows the strongest positive rank order correlation (.5087 significant at the .05 level) with environmentally-oriented project planning behavior is that of EC objectives and top management commitment (herafter referred to as EC objectives). As is discussed later in this chapter, EC objectives appear to be a crucial driving force on which most other components

of a firm's environmental management program depend. Four interrelated working measures of the variable were examined in each firm and summarized into an overall crude indicator of the extent to which the firm is committed to objectives of environmentally-responsible behavior. An organization's goals or objectives are notoriously difficult to observe and measure.[1] Of practical necessity we were forced to take at face value the written and verbal statements of objectives of the top management executives in each firm.

The overall index of EC objectives was created by summing the arbitrarily assigned scores (i.e., yes = 1, partly = .5, no = 0) attained by each firm on four measures: a) whether the firm had a written formal statement of corporate environmental policy, b) whether the firm had a well-publicized expressed objective of "leadership" in the environmental field, c) whether the environmental policy was global in coverage, and d) whether top management support for the environmental policy was frequently illustrated. All four of these measures are crude indicators of the "fullness" or intensity to which the firm has committed itself to objectives of environmental protection. As is shown in Table VI.2, higher scores on the overall index were generally attained by the North American as compared to the Western European firms, and by the chemicals and petroleum firms as compared to the metals firms. The range observed among the firms in the sample was found to be wide: one

TABLE VI.2

INDEX OF EC OBJECTIVES AND TOP MANAGEMENT COMMITMENT [a)]

Firm	Written Formal Statement of Corporate Environmental Policy		Expressed Objective of Leadership in Environmental Field		Environmental Policy Global in Coverage		Frequent Illustrations of Top Management Support for Environmental Policy		Index of Objectives & Top Management Commitment
NAC 1	yes	(1)	yes	(1)	yes	(1)	yes	(1)	4.0
NAC 2	yes	(1)	no	(0)	yes	(1)	yes	(1)	3.0
NAC 3	yes	(1)	partly	(.5)	no	(0)	yes	(1)	2.5
NAC 4	yes	(1)	no	(0)	partly	(.5)	no	(0)	1.5
WEC 1	partly	(.5)	no	(0)	no	(0)	partly	(.5)	1.0
WEC 2	no	(0)	no	(0)	no	(0)	no	(0)	0.0
WEC 3	no	(0)	no	(0)	no	(0)	partly	(.5)	0.5
WEC 4	partly	(.5)	no	(0)	no	(0)	no	(0)	0.5
NAM 1	no	(0)	no	(0)	no	(0)	yes	(1)	1.0
NAM 2	yes	(1)	yes	(1)	no	(0)	yes	(1)	3.0
WEM 1	no	(0)	no	(0)	no	(0)	yes	(1)	1.0
WEM 2	yes	(1)	no	(0)	no	(0)	no	(0)	1.0
NAP 1	yes	(1)	partly	(.5)	yes	(1)	yes	(1)	3.5
NAP 2	yes	(1)	yes	(1)	yes	(1)	partly	(.5)	3.5
NAP 3	yes	(1)	no	(0)	no	(0)	yes	(1)	2.0
WEP 1	partly	(.5)	no	(0)	no	(0)	yes	(1)	1.5
WEP 2	yes	(1)	no	(0)	yes	(1)	yes	(1)	3.0

a) Category sets for indicators appear in Appendix E.

NAC = North American Chem. WEC = Western European Chem.
NAM = North American Metal WEM = Western European Metal
NAP = North American Petro. WEP = Western European Petro.

firm had an environmental policy which was fully formally explicit, expressed in leadership terms, applied globally, and backed by frequent illustrations of top management support; in another firm none of these aspects were present.

Over two-thirds of the MNCs were found to possess a written formal statement of corporate environmental policy. Their content varied widely, and frequently consisted of of sweeping generalities such as: "We will comply with all governmental environmental laws and regulations," or "We will be a good neighbor or good citizen." Some included direct references to planning or decision-making: "We are dedicated to sound environmental planning;" "We will make environmental considerations an integral part of our decision-making process;" and "We will do an environmental impact assessment for all new projects." Very few of the statements said anything about going above and beyond the law. One exception was the policy of one North American Chemical firm: ". . . to make improvements beyond minimum environmental quality legal requirements that result in practical benefit for the environment." The reader is referred to the literature for surveys of corporate environmental policy statements.[2]

Four MNCs had no formal written policy statement and three others had only fragmentary references to environmental objectives in their annual reports. One metals firm had just recently been created by merger and had not yet

found the time to give thought to environmental policy. Some of the firms emphasized that environmental management policy within their firms was still evolving, and two pointed out that it would probably remain in a continuous process of evolution: "If the policy is formal it will sit on the shelf; if it's written it will be out of date by the time it is published." One European petroleum firm had given thought to creating a policy statement but eventually gave up when it realized that "every environmental problem our company faces is unique and no general set of policies could deal effectively with such diversity." One highly centralized small European chemical company saw no need for written policy: "Most policy statements are written more for the benefit of the press and academic researchers like yourself than for anything else."

Only a few MNCs had well-publicized objectives of "leadership" in the field of environmental protection. One chemical MNC expressed its overall objective as a "pattern of excellence and leadership in environmental improvement." The policy document of one U.S. metals firm stated: "Our firm has been and will continue to be in the forefront of efforts to reconcile industrial activities with environmental needs." One of the petroleum companies had a widely-publicized objective "to be a leader in environmental conservation" up to the end of 1971 but then dropped this objective when it perceived a tightening of environmental

regulations and a convergence of competitors' behavior. Most firms were not expressly interested in being at the forefront of their industries; many seemed to view environmental protection as a "reluctantly approached hurdle or operating constraint." One metals executive stressed that his firm had no intention of moving rapidly ahead of social expectations in this area: "We merely attempt to use our influence with the public authorities to set reasonable standards and then live up to those standards."

In only six of the MNCs did the internal environmental policy apply fully or even partly to their worldwide operations. Perhaps the best known set of worldwide corporate environmental policies are the "Global Pollution Control Guidelines" established by The Dow Chemical Company:

> In 1972 Dow issued Global Pollution Control Guidelines for all of its manufacturing operations throughout the world.
>
> The guidelines establish the following principles with particular reference to water, air and noise pollution:
>
> 1. Each Dow site will meet Dow guidelines or local government standards, whichever are tougher.
> 2. At every Dow site, at least one competent person will be assigned to coordinate the environmental function.
> 3. Pollution control will be one of the factors considered in evaluating every line manager's job performance (along with safety, product quality, Equal Employment Opportunity, and productivity).
> 4. Capital authorization requests must include plans for preventing waste problems.

5. Each site will have programs to contain accidental spills and emergency plans to minimize their environmental impact.
6. Dow landfills will be managed in such a way as to make land reclamation possible.
7. Deep wells are not a long-term solution for waste problems except for brine recycling and disposal of salt water.
8. Ocean disposal of waste materials is not acceptable except for spent brine or salt water, where we return like to like.
9. Dow will periodically repeat basic environmental analyses to establish natural, or baseline, levels and to verify if changes have occurred.
10. Since no discharge standard is adequate for all time, Dow plants will determine the need for continuing improvement.
11. Dow will continue to cooperate with enforcement agencies to develop effective and realistic environmental standards.

Ecology Councils in each of the Company's five geographic areas will oversee implementation of the guidelines in cooperation with the Corporate Ecology Council. The latter group includes the president or general manager of each area.[3]

Most of the MNCs had made no attempt to develop a consistent set of policies applicable to their global operations. The policy statements as have been developed and applied pertain almost exclusively to their home country operations. Overseas these firms were explicitly or implicitly pursuing an environmental objective of "local adaptation or accommodation." "Our environmental policy adjusts to the different laws, attitudes, interpretations, esthetic values, and environmental conditions found in each nation," stated one European petroleum firm conservation adviser. "We respond when and where there is social concern for

ecological balance," stated a metals company vice-president. "We try to make sure that our operations and products are compatible with community needs and environmental, social, and economic aspirations," states the policy document of one large petroleum firm. It should be stressed that in no firm did we find a completely uniform or standardized global implementation of corporate policy. Even where the MNC has a generalized worldwide policy, it is always interpreted and applied in the context of local conditions.

In many of the firms interviewed, corporate environmental policies were reinforced by frequent illustrations of top management support. The presidents of three firms had gained reputations for being the leading ecological spokesmen of their industries. In a handful of the MNCs, the board chairmen and presidents made it a point to always be present at the annual company-wide meetings on environmental protection. Policy documents were frequently sent out in the name of the firm's chief operating officer. In one firm, the only position appointment ever announced by the chairman of the board was that of the director of industrial ecology. One chemical president, believing in the influence of physical layout, had the office of the director of environmental affairs placed between his office and that of the senior vice-president. A poignant example of the role of top management support in reinforcing company environmental objectives is the letter in Exhibit VI.1. It was written

EXHIBIT VI.1

MEMO SHOWING TOP MANAGEMENT SUPPORT
FOR ENVIRONMENT DURING
THE ENERGY CRISIS

February 26, 1974

TO: PRESIDENTS OF REGIONAL &
OPERATING AFFILIATES
DEPARTMENT HEADS

The energy crisis has re-emphasized the inter-relationship between the need for conservation of the environment and the need for energy. With worldwide attention being focused on immediate and longer-term energy needs, and on oil supplies in particular, public and political pressures for environmental conservation have diminished considerably. This has been particularly true in the United States where, prior to the emergence of the energy crisis, the emotionalism and politics involved with environmental issues sometimes made it quite difficult to achieve a reasonable balance between environmental, energy and economic needs.

With the critical role of energy availability and needs becoming more apparent, there may be opportunities for the establishment of more reasonable environmental conservation goals and the timetables for their achievement. However, I have some concern that the current situation may be misinterpreted as it relates to (NAP 1's) corporate environmental activities. Therefore, the purpose of this letter is to re-state our attitude and position on environmental conservation in the light of recent energy-related developments and their longer-term consequences.

Basically, (NAP 1's) position remains as stated in my letter of July 18, 1973, a copy of which is attached. These corporate objectives reflect the need to achieve a reasonable balance between energy, economic and environmental considerations. They were prepared in the light of developing energy supply limitations and therefore continue to be applicable, even during the current crisis situation.

More specifically, I feel that the recently reduced environmental pressures should not alter significantly the direction or thrust of our corporate environmental efforts. Our program is not public-image oriented; it is focused on public health needs. These needs have not changed. An efficient and effective environmental program must be a continuing effort, not a superficial or short-term commitment.

continued--

EXHIBIT VI.1--continued

Admittedly, the inter-dependence of environmental and energy needs may now be a more significant factor in establishing environmental goals. Certainly, then, in working with government and regulatory groups we will want to help quantify these relationships either for the purpose of establishing new environmental goals or modifying existing ones. However, it will be important to assure that there is a clear and significant impact upon energy availability before challenging any environmental goals or timetables. Public attention may have shifted to energy, but conservation and pollution abatement remain valued public goals. To challenge these goals now, without a firm basis, could compound the serious credibility problems we are having to deal with. In this context it must be recognized that pressure for environmental conservation was only one of a number of factors which led to the present and projected energy shortage.

In summary, the energy crisis does not seem to warrant any significant change in environmental efforts measured either in terms of our longer-range objectives or our short-term programs. I look to each of you to assure that this message is communicated within your organizations and, where appropriate, externally as well.

President NAP 1

by a major petroleum company president who saw the need to reaffirm top management support for environmental protection activity during the energy crisis of early 1974.

This study has confirmed the hypothesis that the fuller a firm's commitment to environmentally responsible behavior, as evidenced by formal written policy statements, expressions of leadership motives, global application and frequent illustrations of top management support, the greater will be the ecological incorporation embodied in the project planning process. EC objectives appear to relate closest with the dimensions of professional involvement, systematization, formalization, and continuousness. It should be noted that a firm's expressed objectives may differ from those which are actually pursued. This caveat notwithstanding, however, it appears that a genuine commitment to environmental protection with clear signals of top management support may represent a necessary condition for concerted environmentally-oriented project planning. Under such conditions the project planning participants are more likely to "internalize" the objectives and to plan the project in accord with the perceived values important to higher eschelons.

3. Environmental Control Role Assignment

A moderate positive rank order correlation of .3086 (significant at the .13 level) was found between

environmental control role assignment and ecological incorporation. Table VI.3 shows the derivation of an overall crude index of EC role assignment. Four working measures were employed in order to gauge the extent to which each firm had assigned personnel to formal EC roles: a) whether the firm had a corporate level environmental control officer and staff department, b) whether the firm had a corporate level top management environmental control committee, c) whether the firm had corporate level environmental control officers in its research, public relations, engineering, and legal departments, and d) whether the firm had environmental control officers in its major regional or divisional units, operating departments, and plants. No significant difference was found among North American and Western European firms on the overall index, but a greater EC role assignment was evident in the chemical and petroleum firms as compared to the metals firms.

All but a few MNCs had corporate level environmental control directors, advisors, or coordinators.[5] In nine MNCs, these officers were in charge of small staff units entitled for example: "Environmental Control Center," "Industrial Ecology Department," "Office of Environmental Affairs," "Environmental Services Department," and so forth. Many of these officers had chemical engineering backgrounds, but a few came from the natural science disciplines of wildlife ecology, geology, and biology. A few of the staff units

TABLE VI.3

INDEX OF EC ROLE ASSIGNMENT [a]

Firm	Corporate Level EC Officer and Department or Section	Corporate Level Top Management Committee	Corporate Level EC Officers or Sections in Research, PR, Engineering & Legal Depts.	EC Officers in Major Regional or Divisional Units, Operating Depts., and Plants	Index of EC Role Assignment
NAC 1	partly (.5)	yes (1)	yes (1)	yes (1)	3.5
NAC 2	partly (.5)	yes (1)	yes (1)	yes (1)	3.5
NAC 3	partly (.5)	yes (1)	yes (1)	partly (.5)	3.0
NAC 4	yes (1)	no (0)	yes (1)	partly (.5)	2.5
WEC 1	yes (1)	yes (1)	yes (1)	yes (1)	4.0
WEC 2	partly (.5)	yes (1)	partly (.5)	partly (.5)	2.5
WEC 3	yes (1)	yes (1)	yes (1)	partly (.5)	3.5
WEC 4	yes (1)	no (0)	yes (1)	partly (.5)	2.5
NAM 1	no (0)	partly (.5)	partly (.5)	yes (1)	2.0
NAM 2	yes (1)	yes (1)	partly (.5)	yes (1)	3.5
WEM 1	no (0)	no (0)	partly (.5)	yes (1)	1.5
WEM 2	no (0)	partly (.5)	no (0)	partly (.5)	1.0
NAP 1	yes (1)	no (0)	yes (1)	yes (1)	3.0
NAP 2	yes (1)	partly (.5)	yes (1)	yes (1)	3.5
NAP 3	yes (1)	no (0)	partly (.5)	yes (1)	2.5
WEP 1	yes (1)	yes (1)	yes (1)	yes (1)	4.0
WEP 2	partly (.5)	yes (1)	yes (1)	yes (1)	3.5

[a] Category sets for indicators appear in Appendix E.

NAC = North American Chem.
NAM = North American Metal
NAP = North American Petro.
WEC = Western European Chem.
WEM = Western European Metal
WEP = Western European Petro.

were created during the mid and late 1960s, but most were created during the early 1970s. A diverse array of reporting arrangements were discovered, but the EC officer and staff unit most typically reported to either the president, one or more senior vice-presidents, or a research or technical director. In one chemical firm the reporting channel of the unit when it was first created was with the president, a year later it was handed down to an executive vice-president, and three years later was pushed further down to a vice-president of external affairs who also handled governmental and public relations.

The corporate level EC officers, in conjunction with their staffs, were found to be serving coordination, watchdog, advisory, clearing house, external relations, and communications functions. In many of the MNCs, these EC units saw themselves as merely "energizers," not as problem solvers. The words "catalyst," "ginger group," and "focal point" were often used to describe their roles.

The staffs in most of the units consisted of no more than five people. One typical unit in a major European petroleum firm had four professionals: a chemist, a lawyer, an ecologist, and an engineer. These units have been kept small by design. Most MNCs have apparently decided that the development of a centralized cadre of generalist "environmental managers" is not the way in which environmental problems will be solved. Rather, most have

chosen to force the issue into the operating line manager's decision system, while providing him with access to a pool of highly specialized professional resources, both internal and external to the firm. One petroleum company conservation advisor stated: "We have no intention of building a large centralized environmental problem solving group. . . . This would give our line managers the impression that environmental control was only the concern of this one group and it would tend to generate all kinds of staff-line organizational conflicts." Another chemical environmental director added, "A large staff group might get progressively out of touch with the real world line problems, might get involved in a lot of unnecessary work, and furthermore, options for career advancement within such a unit would be minimal."

This study has found some evidence that the creation of a corporate level environmental coordinating staff unit may represent an instrumental, but perhaps transitional, phase in the process by which issues of environmental protection are internalized within the firm.[6] In one chemical MNC, the title of the "manager of environmental affairs" was changed recently to "manager of public issues" and concerns of consumerism, minority hiring, energy conservation and industrial safety were added to his job in order to compensate for the greatly diminished need for his catalytic role in the field of ecology. In one large petroleum firm

the position of "environmental conservation coordinator" was very recently eliminated. As was explained in the firm, the staff unit had served its purpose by providing the necessary thrust and was no longer really needed. Top management was satisfied that enough progress had been made in the development of environmental awareness and in the implementation of a corporate program based upon established objectives that the concept of environmental conservation no longer required a special push. In a few other MNCs, environmental officers freely admitted that the pace of their activity was no longer as hectic as it had been a few years before.

In addition to staff units, over half of the firms had corporate level top management committees concerned with environmental problems. These committees are employed for policy formation, progress review, and in a similar fashion to the staff units, catalytic purposes. In one chemical firm, the role of the committee was viewed as "setting the right tone and promoting the right attitude for environmental quality concern." Multiple committees were found in six of the firms. One MNC had an overall top level environmental quality committee, a manufacturing environmental committee, a product environmental committee, and an occupational safety and health committee. Committee representatives were viewed as "focal points" and "linking pins" through which the firm's environmental communications

network functioned. Environmental committees composed of top management representatives, just like the EC staff units, also appear to be transitory organizational mechanisms for bringing about institutionalization of environmental concern. In many MNCs contacted, these committees met less frequently than they did when first established, and in a few MNCs they had withered away entirely. In the same firm that converted its manager of environmental affairs to a manager of public issues, the top management committee on ecology was recently similarly converted to a top management committee on public issues. It appears that once a top management environmental committee has established environmental objectives, provided guidelines, and catalyzed corporate action its usefulness is greatly diminished.

Environmental roles were found to be integrated into engineering, research, legal, and public relations staff groups in over two-thirds of the firms interviewed. These specialized and technical environmental staff roles appear to be more permanent than the generalized coordinating and committee roles described above. Almost every MNC had added highly trained environmental science professionals to its engineering, technical services, and research units. To a lesser extent, some of the firms had added environmental specialists to their public relations and legal staffs. One large U.S. chemical firm, for example, had three full-time environmental public affairs experts

and six full-time environmental lawyers. Public relations specialists appeared to be most prevalent in the large petroleum firms. One European chemical company, however, which had been subject to extended intense public criticism, was found to have the most sophisticated and most heavily staffed office of environmental public relations. Inside the firm this group was called "our political office of ecology."

Most firms were found to have environmental staff advisors and/or technical specialists in units of the firm below the corporate headquarters level. One petroleum firm, for instance, had at least one qualified technical person whose time was fully committed to environmental affairs in each of its major facilities, operating regions, divisions, and affiliates. Most of the horizontally diversified chemicals MNCs tended to have environmental personnel in their major product divisions, while the vertically integrated petroleum and metals firms tended to have environmental specialists in their operating departments. In many of the petroleum firms, for example, environmental advisor positions had been created in all major functional units, including exploration, production, logistics, marine, manufacturing, and marketing. Those firms with global environmental policies and regional organizational frameworks usually had environmental coordinators at the regional headquarters level.[7]

A MNC's environmental role assignment (i.e., how many personnel, reporting relationships, etc.) in any particular country seems to depend on a number of factors, including: the size of the operation, the nature and range of activities, degree of ownership, local organizational structure, and, most critically, the stringency of the applicable environmental regulation, intensity of citizen action, and extent of governmental reporting requirements. One oil company operating in almost every Western European nation, for example, had full-time environmental coordinators only in the United Kingdom, West Germany, and France. Another petroleum firm had four environmental coordinators for its U.S. operations, four in Germany, two in Canada and only one-half of one man for all of Latin America. Just as we saw environmental objectives to be a function of "local adaptation," so too is a MNC's environmental role assignment.

To summarize, only a moderate positive association has been found between the extent to which a MNC has assigned personnel to formal roles concerned with environmental protection and the extent to which ecological incorporation is embodied in the project planning process. EC role assignment was found, however, to relate rather strongly to the dimension of formalization. Aharoni has pointed out that the "definition of roles by itself creates forces leading the organization to operate in certain directions."[8] What must be added, however, is that roles created for

essentially catalytic purposes may be only temporary. It has been found that the number, placement, activity, and influence of environmental personnel within a firm varies over time. The EC role assignment measurements taken in this study caught firms at different stages of the response or institutionalization cycle: some of the MNCs were just creating new positions and committees, while others were eliminating them. In addition, firms can draw on both internal and external professional expertise for project planning, and the balance of internal-external expertise utilization appears to vary from firm to firm. Finally, the finding that MNCs have not chosen to approach environmental problem-solving by creating large groups of generalist staff advisors, but rather by forcing the issue into the line manager's decision system, implies that measuring the number of people with the word "environment" in their title may be a very poor indicator of the true extent to which concepts of environmental protection have been injected into its role assignment.

4. Environmental Control Performance Measurement

This study has found only a weak direct association (.1627) between the extent to which corporate plant and managerial environmental control performance is measured and evaluated (at the headquarters level) and the extent to which the project planning process is environmentally

oriented. This finding is largely explained by the fact that most of the MNCs in this study were found to be still wrestling with the problem of EC performance measurement and had not yet been successful in adapting their existing performance, evaluation, and reward systems to handle this new issue.

Two working measures were examined in each firm and combined into a crude overall index of EC performance measurement: a) whether plant level EC performance was regularly reported to, and monitored by, a headquarters level unit, and b) whether plant managers were measured and evaluated on the criterion of EC performance. As is shown in Table VI.4, only one firm out of the seventeen was found to be fully doing both of these measurement activities and six firms had made no attempts whatsoever in either of these areas. North American-based MNCs generally scored much higher than their Western European-based counterparts on this variable, perhaps reflecting the broader tendency of North American firms to more formally and more quantitatively measure organizational performance on all counts. Let us now examine some of the limited attempts to measure plant and managerial EC performance and then focus on the common difficulties inherent in designing and implementing effective systems to handle both of these issues.

Various reporting mechanisms were being employed by some of the MNCs to measure EC performance in their

TABLE VI.4

INDEX OF EC PERFORMANCE MEASUREMENT [a)]

Firm	Plant Level EC Performance Regularly Reported to and Monitored by a Corporate Level Unit.		Plant Managers Measured and Evaluated on the Criterion of EC Performance		Index of EC Performance Measurement
NAC 1	yes	(1)	yes	(1)	2.0
NAC 2	yes	(1)	partly	(.5)	1.5
NAC 3	yes	(1)	no	(0)	1.0
NAC 4	partly	(.5)	partly	(.5)	1.0
WEC 1	no	(0)	no	(0)	0.0
WEC 2	partly	(.5)	no	(0)	0.5
WEC 3	no	(0)	no	(0)	0.0
WEC 4	no	(0)	no	(0)	0.0
NAM 1	partly	(.5)	no	(0)	0.5
NAM 2	no	(0)	no	(0)	0.0
WEM 1	partly	(.5)	no	(0)	0.5
WEM 2	no	(0)	no	(0)	0.0
NAP 1	partly	(.5)	partly	(.5)	1.0
NAP 2	yes	(1)	no	(0)	1.0
NAP 3	no	(0)	no	(0)	0.0
WEP 1	partly	(.5)	no	(0)	0.5
WEP 2	partly	(.5)	partly	(.5)	1.0

NAC = North American Chem. WEC = Western European Chem.

NAM = North American Metal WEM = Western European Metal

NAP = North American Petro. WEP = Western European Petro.

[a)] Category sets for indicators appear in Appendix E.

plants or functional operations. In six of the firms the results of plant level residuals output monitoring were periodically sent into the corporate level environmental staff unit. In a few firms "citation and complaint lists" were kept by the top EC officer on a plant by plant basis. Three firms had added an EC section to their "monthly operating review forms" which had to be filled in by each plant manager. One chemical company environmental affairs director maintained a "surprise list" which crudely measured how well each department and plant had stayed out of environmental trouble. Two MNCs had added an EC performance criterion to their annual plant level stewardship reviews. Many of the larger petroleum and chemical firms had created well developed systems for the reporting of spills of oil and hazardous substances; in some of these systems the spill had to be reported within 24 hours and would be translated into a "spill letter or notice" and sent out to all plants around the world. The mandatory governmental spill notification requirements of the U.S. Federal Water Pollution Control Act may account for these highly developed systems.[9] One large petroleum company had engaged more than 100 retired ships' officers, mostly from its own fleet, as pollution control officers in the U.S. and Europe for its spill prevention and reporting system. These officers were visiting chartered ships while in port to assure that the company's pollution avoidance procedures were being

rigorously followed and to inspect for potential pollution hazards.

One U.S. chemical company included the following environmental control parameters in an experimental plant level social impact audit:

a. Water parameters - effluent (net loading)

	Allowable under standards for 1975	Current average loading	
Total suspended solids	_____	_____	M lbs./day
Total dissolved solids	_____	_____	M lbs./day
Total chlorides	_____	_____	M lbs./day
BOD	_____	_____	M lbs./day
TOC or TOD	_____	_____	M lbs./day

b. Water parameters - receiving water

Temperature increase above ambient _____

pH change from upstream value _____

c. Air parameters

Complaints received (all causes) _____

d. Government citations received _____

The above plant level environmental control audit was only performed for the firm's operations in the United States. In a similar fashion, many of the performance measurement mechanisms discussed above were only utilized by the MNCs in their home country operations. Most had not yet attempted to extend EC performance measurement to overseas operations. In addition, the mechanisms employed in

any one firm varied considerably from division to division and from function to function.

This study has found that EC performance has generally not been formally added as a criterion in the measurement and evaluation of executive performance. Only one firm had formally added environmental control as a factor in the appraisal of plant supervisor performance along with such traditional items as cost control, employee morale, safety, etc. In most of the MNCs environmental control was found to enter into executive evaluation, if at all, only in a very informal and subjective way.

A few of the MNCs were attempting to apply rewards and sanctions for conformity or deviance with corporate EC objectives. One oil firm environmental coordinator stated: "We've tried to bring attention to real environmental control achievers in the company by including profiles of these people in our company-wide environmental bulletin. We've also pointed out poor performance. Once we relieved a tanker captain of his ship for a bad spill that could have been easily prevented. He is now stationed here at headquarters and is rewriting the tanker environmental safety manual." Another chemical company has rewarded superior performance by giving some of its managers "public service awards." This same firm fired a production manager of one of its largest plants when he failed to solve some key environmental problems. "Believe me,"

said the firm's environmental control director, "the message was not lost in the division."

Performance measurement systems in most MNCs are predominantly financial in their orientation. Measures of EC performance do not appear to mesh very well with the "bottom line" logic and cost-accounting nature of these existing financial measurement, evaluation, and control systems. As Ackerman has found, accountability for social issues such as environmental protection threatens the traditional management patterns of divisional operating autonomy, monitoring by financial reporting systems, and financially oriented executive performance evaluation.[10]

EC performance measurement of both plants and managers is fraught with practical and conceptual difficulty. Even the director of environmental affairs in one of the MNCs which has done more than others in this area admits, "We just haven't been able to come up with a good way of doing this." The problem of valid indicators appears to be a formidable obstacle. Intracompany variation in the age, size, and residuals output characteristics of plants, as well as the wide variation in applicable laws and regulations, creates such situational diversity that comparisons between the EC performance of one plant versus another becomes almost impossible. Problems of incommensurability particularly arise in the vertically integrated firms. One aluminum firm with mining, refining, transport,

smelting, fabricating, and marketing activities found, for example, that no across-the-board indicators could be applied. Measures of EC performance are not generally amenable to corporate-wide aggregation. Finally, it should be noted that company-wide EC performance measurement is logically inconsistent with the existing policies of "local adaptation" embraced by most MNCs. How can the performance of managers or plants in different locations be viably compared when the firm has explicitly or implicitly instructed them to adjust to the local community environmental needs and standards (i.e., "to perform against different national yardsticks")?

To summarize, we have found the extent of EC performance measurement in a MNC to be only weakly correlated with the extent of ecological incorporation in its project planning process. The reason for this low association appears to be the fact that both low and high incorporators have generally resisted "contaminating" their existing financial reporting systems with the incommensurable and complex issues of environmental protection. In most MNCs, environmental management is a divisionally, functionally, and geographically decentralized decision area and thus is not organizationally compatible with corporate-wide performance measurement. Finally, the link between EC performance measurement and the behavior of new plant project planners may be very indirect and rather weak. The priorities and

time frames of project planners may differ considerably from those of the executives who will actually manage the plant once it is operational.

5. Environmental Control Research and Technology Programs

Only a small positive rank correlation (.1014) was found between the extent to which the firm had researched, developed, and commercialized environmental control technology and know-how relevant to the project and the extent to which ecological incorporation was embodied in the project planning process. The inability to procure environmental R & D spending data across all firms in the sample necessitated the use of three crude indicators of the extent of relevant EC research and technology programs. As shown in Table VI.5, the following working measures were combined into an overall index of EC research and technology programs: a) the extent to which the firm was selling project-relevant EC technology and services externally; b) the extent to which the firm had self-developed project-relevant EC technologies; and c) the extent to which the firm had engaged in project-relevant basic environmental research, product impact research, and joint-industry environmental research programs. No significant difference on this variable was observed between the North American and Western European firms, but in a similar fashion to other variables in this study, the petroleum and chemical firms

TABLE VI.5

INDEX OF EC RESEARCH AND TECHNOLOGY PROGRAMS [a)]

Firm	Extent of Selling Project-Relevant EC Technology & Services Externally	Extent of Self-developed Project-relevant EC Technologies	Extent of Engagement in Basic Environmental Research, Product Impact Research, & Joint-industry Environmental Research Programs	Index of EC Research & Technology Programs
NAC 1	high (1)	high (1)	high (1)	3.0
NAC 2	med. (.5)	med. (.5)	high (1)	2.0
NAC 3	high (1)	high (1)	med. (.5)	2.5
NAC 4	med. (.5)	med. (.5)	high (1)	2.0
WEC 1	low (0)	med. (.5)	med. (.5)	1.0
WEC 2	high (1)	med. (.5)	med. (.5)	2.0
WEC 3	med. (.5)	high (1)	high (1)	2.5
WEC 4	med. (.5)	high (1)	med. (.5)	2.0
NAM 1	med. (.5)	high (1)	med. (.5)	2.0
NAM 2	low (0)	med. (.5)	med. (.5)	1.0
WEM 1	med. (.5)	med. (.5)	low (0)	1.0
WEM 2	low (0)	med. (.5)	med. (.5)	1.0
NAP 1	low (0)	high (1)	high (1)	2.0
NAP 2	low (0)	high (1)	high (1)	2.0
NAP 3	med. (.5)	high (1)	med. (.5)	2.0
WEP 1	med. (.5)	high (1)	high (1)	2.5
WEP 2	low (0)	high (1)	high (1)	2.0

NAC = North American Chem. WEC = Western European Chem.

NAM = North American Metal WEM = Western European Metal

NAP = North American Petro. WEP = Western European Petro.

[a)] Category sets for indicators appear in Appendix E.

were generally found to have more advanced programs than the metals firms. It should be noted that measurements on all three indicators were taken as of the time of the specific project in question; EC research and technology efforts subsequent to the project are not reflected in these scores.

Environmental research and technology activity tends to be concentrated for the entire MNC in a single facility or at a very few locations. The principal research facility was found to invariably be in the home nation for the following reasons: reduction of overhead costs, proximity to "familiar" governmental and university centers of environmental research, access to government-financed environmental research, scale requirements of relevant R & D activity, enhancement of managerial control, proximity to the bulk of company operations having pollution problems, ease of recruitment of specialized environmental professionals, and likelihood of capturing spillovers from the firm's other R & D activities, which also tend to be concentrated in the home nation.

Eleven of the seventeen MNCs were found to be selling their EC systems and know-how to other companies. In most of the firms this was a relatively minor activity, but in three of the chemical firms this had become a significant line of business. A few of the eleven companies had begun their environmental services business during the late

1960s, but most did not attempt to commercialize their EC efforts until the early 1970s. Some of these firms had proceeded by means of external acquisition of pollution control firms, but the predominant pattern had been one of internal development. In-house R & D and experience had resulted in the creation of patented EC equipment and analytical techniques which the firm then decided could be marketed externally. Outside commercialization was seen in a few firms as a stimulant to further in-house research. The director of a European chemical company's environmental technology department stated: "I can definitely say that more in-house EC research and development is being done because of our external sales; with a wider market to spread R & D costs over, and with the pressure to maintain a sound external environmental image, I have found our top management and research people to be much more eager in undertaking EC pioneering efforts."

A wide variety of EC products, processes, and services were being marketed by the MNCs. Examples include: process water treating chemicals, trickling biological filters, noise and vibration control equipment, chemical dispersants for oil spills, oil spill recovery booms and skimmers, flocculants, solid waste recycling systems, fiber filter bags, molecular sieve adsorbents, smoke stack emissions monitors, desulphurization processes, environmental enclosures, inorganic coagulants, dry scrubbing systems for

aluminum reduction plants, etc.[11] A broad range of investigatory and analytical services were offered by some of the firm's EC technology departments. One U.S. chemical firm had acquired an environmental engineering consulting firm with capabilities in the areas of water systems, wastewater, hydrology, storm drainage, land planning, aerial photogrammetry, noise abatement, etc. The EC technology unit of one European chemical firm offered the following kinds of services in the area of treatment and disposal of liquid and liquid/solid wastes: biological treatability studies, solids removal laboratory and pilot investigations, equipment evaluation, tertiary treatment investigations, works site surveys, hydrographic surveys, bioassays, ecological surveys of rivers and estuaries, bacteriological surveys, mammalian and avian toxicology studies, pesticides effects studies, radioisotope surveys, etc. Finally, in addition to EC services, one U.S. chemical company was making its energy efficiency expertise available outside the firm in the form of an energy conservation consulting group.

Many of the above mentioned project-relevant EC technologies and services were developed internally by the firms. Self-developed methods of odor control, solid residue disposal and desulphurization were being applied in the steelworks modernization; self-developed air stack sampling equipment was being installed in the hydrofluoric

acids plant; the prebake and vertical stud potlines of the aluminum smelter were equipped with the firm's own patented dry scrubbing systems; and a recently self-developed system for containing and recovering oil spills under open sea conditions was being installed for use in the offshore oil complex. Other firms were applying self-developed cleaner production processes. The research thrust in the firms investing in the polypropylene plant and petrochemical complex, for example, had rested with in-plant process level pollution abatement. Rather than "end-of-pipe" terminal treatement facilities, these firms had engaged in research to abate pollution at the source, with an emphasis on recycling, increased yields, and waste prevention.

In addition to in-house EC technology development, many of the firms were found to be engaged in project-relevant basic, product, and joint industry environmental research. Many of the firms had recently created environmental studies sections in their basic research units. One large European petroleum firm stated that during 1973 it had spent seven percent of its basic research budget explicitly on environmental issues and that 400 people were involved in the effort. One North American aluminum company had been studying the effect of fluoride on animals since the late 1940s. This firm had been operating farms near its smelters since 1957 in order to study fluoride absorption by livestock. Another metals company had recently devoted

considerable basic research effort to the problem of tailings pond reclamation. One U.S. chemical firm had researched and developed an aeration system for solving the problem of lake eutrophication and was currently researching various petrochemical complex wastewater recycling systems for the U.S. Environmental Protection Agency.

Only a few of the firms were found to have active product-oriented environmental research programs, and all of these were chemical firms. The movements in both the U.S. and Europe toward the control of toxic chemicals,[12] and the recent concern over carcinogenic substances created by the "vinyl chloride-angiosarcoma" scare[13] were apparently, however, causing more and more of the firms to begin considering questions of product impact. One U.S. chemical company had recently created a "Product Environmental Committee" and had expanded its research program in the area of determining the toxicological, allergenic, and other possible harmful properties of chemical products. As revealed in the press, the cost of advance product testing can run high: Union Carbide Corp.'s chemical and plastics group spent $900,000 on testing during fiscal 1973 (on sales of $1.67 billion and pretax profits of $212 million) and Dow Chemical spends $8 million annually for testing (on U.S. sales of $1.7 billion and post-tax profits of $215.5 million).[14] Dow's formalized program of product environmental safety, called "product stewardship," has been well publicized. This

program involves inputs from the research and development, manufacturing, and marketing departments of the company and consists of an integrated program of product impact research, creation of product impact data profiles, education of salesmen, and communications to distributors and customers.[15] Product stewardship in research involves an examination of four variables:

> . . . Stability of a chemical is measured by hydrolysis, photosensitivity or micro-organism decomposition. Movement of a product in the environment is measured by examining water solubility, vapor pressure, or by tracing its food chain route. Bioconcentration is measured by comparing a product's relative solubility in fats or oils with its solubility in water. The fourth variable is toxicity.[16]

The final area of project-relevant environmental research examined in this study was that of joint-industry efforts. These kinds of programs were most evident in Western Europe, reflecting conducive anti-trust policies according to many of the observers interviewed. In industry terms, cooperative efforts were most noticeable in the petroleum industry, reflecting the commonality of product, activity, and process-related environmental problems faced in this industry as compared to the wider diversity of problems found in industries such as chemicals and non-ferrous metals. One example of a joint industry environmental research program is CONCAWE (The Oil Companies' International Study Group for Conservation of Clean Air and Water in Western Europe) which was initiated in 1963 by

the British Petroleum Company Limited and the Royal Dutch/Shell Group.[17] Today this organization has twenty participants, representing about 80% of the refining capacity in Western Europe. CONCAWE's basic function is to examine and to promote the use of means for preventing air, water, ground, and noise pollution attributable to the oil refining industry and to the use of oil products. Its objectives are fourfold:

1. The collection and dissemination to participating companies of scientific, technical, and legal information from world-wide sources dealing with causes and effects of air, water, sea, and ground pollution attributable to the oil industry and to the use of petroleum products.
2. The promotion of active cooperation between the participating companies to secure the flow of information.
3. The development of work programmes and the provision of funds to research institutes to seek and obtain new knowledge about pollution by the oil industry and its products and how it can be abated.
4. To make available to others--an in particular to local authorities, governments, international and intergovernmental organizations and research institutes--the results of studies and the considered views of the study group.[18]

Many other joint-industry efforts could be mentioned. Two related to product questions are notable. The Ecological and Toxicological Association of the Dyestuff's Manufacturing Industry (ETAD) was recently founded in Switzerland by a number of European and Japanese chemical companies. ETAD's goals are to coordinate and unify efforts of

synthetic organic dyestuff makers in order to lower ecological impact in use and applications of the industry's products and to provide the best possible and practicable protection for product users. Another effort which recently came to attention was the jointly-sponsored research of Cesare Maltoni at the Institute of Oncology in Bologna, Italy, who discovered the link between vinyl chloride and the rare liver cancer of angiosarcoma. His work was sponsored by Montedison, ICI, Solvay, and Rhone-Progil.[19]

Many of the MNCs were found to be actively engaged in "applied" environmental research, development, and commercialization activities. The extent of this effort in any one firm, however, was not found to be strongly related to its level of environmentally-oriented project planning behavior. One reason for this finding is that some firms with a wealth of expertise, resources, and technology in the environmental control area do not necessarily apply it to their own projects, especially when these projects are located abroad. This was especially true in the case of four chemical firms, where all four widely advertised their strong EC investigatory and analytical services to external customers, but failed to apply these services in the contexts of their own specific overseas projects examined in this study. Given the "local adaptation" environmental strategy adopted by most MNCs, such advanced technology and

expertise is often deemed to be unsuitable or unnecessary for use in a foreign investment project.

In a few cases only very weak links were found between the firm's office of environmental affairs and office of external EC sales. One environmental control director stated: "We keep each other informed so as to avoid potentially embarassing questions, but really we deal with two different worlds." Some of the firms have concentrated their external commercialization efforts on municipal wastewater and solid waste treatment projects which have only partial relevance to their own industrial projects. A few of those firms with low overall scores on this variable expressed the view that the decision to stay out of the pollution control business had been a conscious one. These firms felt that the development of expensive new EC technologies could be better done by the specialized outside EC engineering companies. Other firms wanted to avoid going into the EC business because they saw it as a potentially unprofitable fad.[20]

6. Environmental Control External Surveillance and Interaction

A rather strong positive rank correlation (.4938 significant at the .02 level) was found between the extent of the firm's external surveillance of, interaction with, and internal dissemination of information about the actions and plans of groups concerned with environmental protection,

and the extent of ecological incorporation embodied in its project planning process. Five measures reflecting at least crudely the relative extent of "anticipatory interdependence" with external groups on environmental issues were combined into an overall index of EC external surveillance and interaction: a) extent to which the firm had direct and regular corporate level contacts with governmental EC agencies; b) extent to which the firm had direct liaison with, and monitored the actions of, conservation groups and professional environmental organizations; c) extent to which the firm had assigned staff for the purpose of monitoring EC laws, legislation, technology, and events; d) extent to which the firm was involved in inter-industry groups and government-industry groups on EC matters; and e) extent to which the firm was producing and broadly distributing an internal trend letter, bulletin and/or bibliography on EC matters. On the basis of the overall index, as shown in Table VI.6, North American firms generally scored slightly higher than Western European firms, but there were no significant differences in the average scores attained across the three industries.

This study found most MNCs to be engaging in a great deal of direct contact with governments, legislative bodies, and regulatory agencies on environmental matters. Although the extent of contact was found to be similar in Western Europe and North America, the "character" of this

TABLE VI.6

INDEX OF EC EXTERNAL SURVEILLANCE AND INTERACTION[a)]

	Extent of Direct and Regular Corporate Level Contact with Governmental EC Agencies	Extent of Direct Liaison with, and Monitoring of, Conservation Groups and Professional Environmental Organizations	Extent of Staff Assigned to Monitor EC Laws, Legislation, Technology, Events, etc.
NAC 1	high (1)	med. (.5)	med. (.5)
NAC 2	high (1)	low (0)	high (1)
NAC 3	high (1)	med. (.5)	med. (.5)
NAC 4	high (1)	low (0)	high (1)
WEC 1	high (1)	low (0)	med. (.5)
WEC 2	high (1)	low (0)	med. (.5)
WEC 3	med. (.5)	low (0)	med. (.5)
WEC 4	med. (.5)	high (1)	high (1)
NAM 1	high (1)	low (0)	med. (.5)
NAM 2	high (1)	high (1)	high (1)
WEM 1	high (1)	med. (.5)	high (1)
WEM 2	med. (.5)	low (0)	low (0)
NAP 1	high (1)	high (1)	high (1)
NAP 2	high (1)	med. (.5)	high (1)
NAP 3	high (1)	med. (.5)	high (1)
WEP 1	med. (.5)	high (1)	med. (.5)
WEP 2	med. (.5)	low (0)	med. (.5)

continued--

TABLE VI.6--continued

	Extent of Involvement in Inter-industry Groups and Government-industry Groups on EC Matters	Extent of Production and Distribution of Internal Publications on EC Matters	Index of External Surveillance and Interaction
NAC 1	med. (.5)	high (1)	3.5
NAC 2	med. (.5)	high (1)	3.5
NAC 3	med. (.5)	med. (.5)	3.0
NAC 4	med. (.5)	low (0)	2.5
WEC 1	high (1)	low (0)	2.5
WEC 2	low (0)	med. (.5)	2.0
WEC 3	high (1)	high (1)	3.0
WEC 4	med. (.5)	high (1)	4.0
NAM 1	low (0)	low (0)	1.5
NAM 2	med. (.5)	high (1)	4.5
WEM 1	high (1)	low (0)	3.5
WEM 2	med. (.5)	low (0)	1.0
NAP 1	high (1)	high (1)	5.0
NAP 2	high (1)	med. (.5)	4.0
NAP 3	med. (.5)	low (0)	3.0
WEP 1	high (1)	low (0)	3.0
WEP 2	high (1)	high (1)	3.0

a) Category sets for indicators appear in Appendix E.

NAC = North American Chem. WEC = Western European Chem.
NAM = North American Metal WEM = Western European Metal
NAP = North American Petrol. WEP = Western European Petro.

close contact did appear to differ. As a general rule, the contact processes in Western Europe were "cooperative" in character, while those in North American (especially in the U.S.) were typically "competitive" in nature. This was most evident in the setting of environmental standards. MNCs appear to have a stronger influence in Europe than in North America. Much of the industry-government contact in Europe takes place prior to the establishment of enforcing legislation, and takes the form of cooperative negotiations, joint research into possible technical solutions, and free-flowing communication. In the United States much of the contact appears to take place after the controlling legislation and standards have already been established and frequently takes the form of competitive bargaining, arguing over the viability of technical solutions, and dilatory efforts to delay implementation.

Most MNCs have not attempted to centralize the governmental contact process at the headquarters level, but rather have generally created a "structure of decentralized contact." Contacts with local and regional governmental bodies are usually carried out by local plant management; contacts with national governmental bodies by managers from the national subsidiary or affiliate; and contacts with international governmental bodies by personnel from the firm's world headquarters. Exceptions to this general pattern were observed (e.g., crisis situations necessitating

the intervention and influence of top level corporate personnel), but for most firms and most contact situations, this symmetrical structure, which matches level of government to level of corporation, was found to be most common. A few of the larger MNCs attempt coodination by requiring headquarters notification of all meetings held between company managers and governmental officials at all levels.

A few additional observations on governmental contact are noteworthy. First the extent and nature of contact between a firm and governmental bodies varies widely internationally and among localities. One Dutch chemical firm manager expressed: "The way we relate to regulatory bodies in the Netherlands, Germany, and the United Kingdom is very different; even within Holland, our external relations practices are different in the east of Holland from the west of Holland; it all depends on the style of the civil servants and the traditions of cooperation." Second, the contacts are often initiated by the governmental body, especially in Western Europe. As one German petroleum firm environmental advisor stated: "I am constantly called on by the state government, national government, and the E.E.C. for advice and counsel." Finally, some MNCs, especially the British MNCs, expressed that they prefer, if possible, to interact with governmental bodies via the trade association route.

In marked contrast with considerable governmental contact, most MNCs do not engage in direct liaison with citizen environmental organizations. More than half the firms expressed that direct contact with such groups is only done when absolutely necessary, such as in a new project confrontation. A few of the firms noted that they do attempt to maintain indirect contact by means of being on the groups' mailing lists. One North American environmental conservation director was a member of seven environmental groups: the Sierra Club, Friends of the Earth, Izaak Walton League, Audubon Society, Environmental Defense Fund, Wilderness Society, and National Wildlife Federation. "Being a member of these groups and receiving their literature, allows me to keep my finger on the pulse of the environmental movement. For example, I was able to provide top management with advance warning on the potential explosiveness of the oil shale and coal gasification issues well before our firm had gotten too deeply committed to these endeavors," stated the executive. Only four of the MNCs had attempted to maintain a close working liaison with environmental groups. One metals firm had an environmental information specialist in its EC staff unit whose full-time job was to keep track of the activities, viewpoints, and legal maneuvers of all major and minor environmental groups in the U.S. This specialist had developed an extensive network of informal contacts in the environmental

community. Public affairs specialists in the other firms performed similar functions. In addition to these informal contacts, all four of these firms also attempted to encourage a great deal of formal liaison by means of speeches at group meetings, invitations to corporate meetings, etc.

Almost all of the MNCs were found to have assigned staff for the purpose of monitoring trends and events in the areas of EC legislation and technology. The effort was found to be more extensive and formalized in some firms than others, however. Many of the firms expressed the necessity and benefits of monitoring developments in this "turbulent" area. "The more notice you have of what is coming, the easier it is, and usually the cheaper it is to adapt to the new conditions," said one European chemical environmental advisor. Some of the environmental coordinators saw anticipatory monitoring of impending developments in the environmental arena as their main function. One petroleum coordinator's job description stated: "This position will be mainly concerned with the continuous collection, evaluation, and dissemination of information pertinent to pollution." Another environmental law coordinator's job description stated: "He will gather, review, and disseminate appropriate information related to current court decisions, legislative actions and governmental regulations which affect the company's environmental activities and be available for consultation in these matters."

The external monitoring job was done by different kinds of personnel in different MNCs, but usually by the EC coordinator or members of his staff. In some firms, however, this activity was being carried out by environmental lawyers on the corporate legal staff, by the top management EC committee, or by members of the public affairs office. The pattern of external monitoring was similar to the pattern of governmental contact; international trends were being monitored at headquarters, national trends at the national subsidiary level, and local trends at the local plant level. The extent of external monitoring was seen in a few firms to follow a life cycle. "At first during 1970 and 1971 there was a great deal of monitoring effort on what was happening each day in Washington, D. C. and the acquired information was voluminous; we have since drastically decreased this effort to more of an 'exception' monitoring system," stated a U.S. petroleum conservation advisor. In other firms, the top management committees, when newly formed, devoted considerable effort to monitoring and auditing the changing legislative and regulatory framework within which their firms were operating. Over time this special effort tapered off as the monitoring function became institutionalized in staff support units.

The monitoring of external developments was being done in many different ways. Media reports of legal and administrative trends such as the U.S. Federal Register and

Environment Reporter were being read weekly by most environmental coordinators. Many of the MNCs had representatives located in the capital cities of the major countries in which they were operating. These public affairs specialists, lawyers and/or lobbyists were being utilized in various capacities but primarily as antennas for detecting change. Trends in the area of EC technology were being followed by means of journals, professional meetings, and information supplied by manufacturers of pollution control equipment and services. Informal communication channels between company personnel and both governmental civil servants and counterparts in other firms were apparently the primary means by which most of the developments were being first detected. Finally, industry trade associations were being used by many firms, especially in Europe, for the purpose of tracking the winds of change in the environmental area.

Participation in intra-industry, inter-industry and government-industry groups on EC matters was found to be generally higher for the petroleum as compared to the chemical and metals firms, and for the European as compared to the North American-based firms. The rationale of such participation was expressed by one European petroleum firm executive as: "Pollution control in our industry, at least within Europe, is not perceived as a competitive area; by sharing experience and exchanging information the duplication of effort can be minimized; a common industry stance

on EC issues gives us strength when urging consideration or adoption of certain ideas or proposals; finally, when the industry stands united on an issue the government can't use the strategy of divide and conquer."

Two variables appear to explain the extent of participation in external industry groups. The first is the homogeneity of environmental problems. Firms in the petroleum industry appear to share many common environmental impact problems, while the problems of firms in the chemicals and metals industries are comparatively much more diverse. The second variable is cultural views on the role of industry-wide collaboration. In much of Europe, joint-industry environmental agreements and cooperation are accepted when economic efficiencies can be realized. In the U.S. the view of business is that communications between competitors should be minimal in order to maintain competition and environmental collaboration tends to be discouraged.

A list of some of the external industry and international governmental groups in which one or more of the firms in the study had been involved appears in Exhibit VI.2. Many of the EC personnel interviewed served on environmental committees in the industry organizations. In the case of the governmental organizations, many had served as technical advisors or consultants. this exhibit does not include international conferences such as the recent United Nations World Food Conference, Law of the Sea Conference, and

EXHIBIT VI.2

SELECTED GOVERNMENTAL AND INDUSTRY GROUPS
DEALING WITH ENVIRONMENTAL ISSUES

International Governmental Organizations

Commission of the European Communities
Council of Europe
Food and Agricultural Organization (via Industry Cooperative Program)
General Agreement on Tariffs and Trade
Inter-American Development Bank
Inter-American Economic and Social Council
Inter-Governmental Maritime Consultative Organization
International Bank for Reconstruction and Development
International Civil Aviation Organization
International Council of Scientific Unions
International Joint Commission
International Labor Organization
International Organization for Standardization
North Atlantic Treaty Organization (Committee on the Challenges of Modern Society)
Organization of American States
Organization of Economic Cooperation and Development (via Business and Industry Advisory Committee)
United Nations Development Program
United Nations Education, Scientific, and Cultural Organization
United Nations Environment Program
United Nations Economic Commission for Europe
United Nations Economic Commission for Latin America
United States Agency for International Development
World Health Organization
World Meteorological Organization

Chemicals Industry

American Chemical Society
The Ecological and Toxicological Association of the Dyestuffs Manufacturing Industry
European Council of Chemical Manufacturers' Federations
Institute for Chemical Toxicology
Manufacturing Chemists Association
Synthetic Organic Chemical Manufacturers' Association
The Swiss Society of Chemical Industries

continued--

EXHIBIT VI.2--continued

Metals Industry

American Institute of Mining Engineers
American Iron and Steel Institute
American Mining Congress
European Primary Aluminum Association
German Steel Industries Association
International Iron and Steel Institute
International Primary Aluminum Institute

Petroleum Industry

American Petroleum Institute
Inter-Industry Emission Control Program
International Petroleum Industry Environmental Conservation Association
International Tanker Owners Pollution Federation
North Sea Operators Committee
Oil Companies International Marine Forum
Petroleum Association for Conservation of the Canadian Environment
The Petroleum Association of Japan
Petroleum Industry Environment Executive (Australia)
Stichting CONCAWE
U. K. Institute of Petroleum

General Industry

American Institute of Merchant Shipping
Chamber of Commerce of the U.S.A.
Committee for Economic Development
Conference Board
Confederation of British Industry
Council of European Industrial Federations
Council of Netherlands Economic Organization
Federation of Belgian Industries
Federation of German Industries
Federation of Swedish Industries
International Center for Industry and the Environment
International Chamber of Commerce
International Organization of Employers
Japanese National Committee of the I.C.C.
National Industrial Pollution Control Council
National Academy of Engineering
National Academy of Sciences
National Association of Manufacturers
Union of Industries of the European Community
U.S. Council of the I.C.C.

Conference on the Human Environment. Some of the national delegations at the Law of the Sea Conference, for example, were heavily constituted with corporate representatives from the metals and petroleum industries. The exhibit also does not include the countless informal external industry organizations. Over the past few years, for example, the environmental coordinators of seven of the largest U.S. chemical firms have met on a bimonthly basis to discuss mutual problems, pending legislation, and so forth.

The last component of the overall index of EC external surveillance and interaction relates to the question of internal dissemination of the acquired information. Over half of the MNCs were found to have formalized the process by means of regularly producing environmental trend reports. One U.S. metals MNC was issuing a company-wide environmental trend report every six months. This report included a rundown of recent technological developments, research and development, and legislation that might have an impact on company activities. A list of environmental experts, both within and outside the firm and their achievements in areas that might prove to be helpful in guiding the firm's environmental decisions was also included in the report. As was expressed by the company's environmental director: "The report keeps environment in their minds and enables our people to find a ready source of expertise in handling specific environmental problems."

Five of the firms produced monthly bibliographic bulletins providing citations and capsule summaries of recent environmental articles and research reports. Three of the larger MNCs with sophisticated "selective dissemination of information systems," which distribute abstracts or complete articles to personnel based on a computerized "key word" system, had added a range of EC-related key words to the system. In addition to trend reports and bibliographic services, some of the firms produced house organs entirely devoted to matters of environmental protection. These publications included successful case histories, interviews with researchers and governmental officials, announcements of new programs, notifications of upcoming external environmental conferences, etc. The above dissemination efforts relate only to formal mechanisms; it should be noted that much of the information acquired via external monitoring is probably internally disseminated through informal channels of communication.

It has been found that the extent of a firm's EC external surveillance and interaction is strongly correlated with the extent to which its project planning is environmentally-oriented. It relates most strongly with the dimensions of formalization, continuousness, and professional involvement. Direct contact with governmental EC bodies, direct liaison with citizen environmental groups, extensive monitoring of EC trends and events, wide

participation in industry EC groups, and formal internal dissemination of acquired information are all indicators that the firm is an "open system" with respect to matters of environmental protection. As an open system, the firm is exposed to a wider variety of external ideas and receives more feedback on the satisfaction and intentions of "normative reference groups." Such exposure and feedback is apparently quite conducive to innovative ecological incorporation behavior.

7. Company Profitability

This study found only a small positive rank correlation of .1933 between a firm's relative profitability and the extent of ecological incorporation embodied in its project planning process. Relative profitability was calculated by dividing each firm's average profits for the period 1971-1973 by its average sales for the same period. The range extended from a negative percentage to over .10, with the median profitability being .067. Five firms had percentages under .04 and three firms had percentages greater than .08. The rank order of these relative profitability rates is presented in Table VI.7. The petroleum firms were on average slightly more profitable than the chemical firms and both of these groups were on average significantly more profitable than the metals firms. The

TABLE VI.7

RANK ORDER ON COMPANY PROFITABILITY, SIZE AND INVESTMENT INTENSIVENESS[a]

Firm	Company Profitability[b]	Company Size[c]	Company Investment Intensiveness[d]
NAC 1	15	7	14
NAC 2	17	13	17
NAC 3	12	2	12
NAC 4	8	10	6
WEC 1	2	8	4
WEC 2	5	4	9
WEC 3	9	12	3
WEC 4	1	11	10
NAM 1	6	5	2
NAM 2	14	3	16
WEM 1	3	6	8
WEM 2	4	1	1
NAP 1	16	17	11
NAP 2	10	15	15
NAP 3	7	9	5
WEP 1	11	14	13
WEP 2	13	16	7

a) Rank of number 1 equals lowest; 17 equals highest.

b) Rank ordered result of dividing average profits for the period 1971-1973 by average sales for the same period.

c) Rank ordered result of computed average sales for the period 1971-1973.

d) Rank ordered result of dividing average capital expenditures for the period 1971-1973 by average total assets for the same period.

NAC = North American Chem. WEC = Western European Chem.
NAM = North American Metal WEM = Western European Metal
NAP = North American Petrol. WEP = Western European Petro.

North American-based MNCs were generally much more profitable than their Western European counterparts.

Certain measurement problems may account for the observed low association. First, a worldwide total corporate profitability rate may be too aggregate an index to accurately reflect conditions of success or slack in the specific unit of the firm undertaking the project. One of the lowest ecological incorporation scoring projects, for example, was undertaken by one relatively unprofitable division of a MNC that achieved a very respectable rate of profitability on a total corporate-wide basis. The inability to procure divisional and regional profit and sales information necessitated the use of the aggregate figure. Second, comparisons of corporate profitability rates across all nationalities and industries involve problems of different accounting techniques, disclosure regulations, and statement periods. In addition, the normative profit rates to which a firm may compare itself may be those attained by its closest industrial competitors operating in similar geographic regions, not those of all firms across all industries and nations. A re-examination of the data on a disaggregated continental-specific industry basis shows that for firms in the same industry and based in the same continent, the correlation between relative profitability and ecological incorporation is fairly strong. Decomposing an already small sample into an even smaller set of groups,

however, does not provide one with much evidence to work with.

The above measurement difficulties notwithstanding, it does appear that profitability may have a genuine, but weak influence on ecological incorporation. It appears to exert its influence primarily in an indirect fashion, by allowing the firm to have a larger current capital investment program, more deeply-held environmental objectives, and more extensive external scanning. These factors, in turn, are strongly directly related to ecological incorporation.

8. Company Size

A mild positive rank order correlation of .2706 (significant at the .17 level) was found between the size of the firm and the extent of ecological incorporation embodied in its project planning process. Average sales for the period 1971-1973 was utilized as the indicator of company size. The median size was $3.3 billion in sales and the range extended from under $1 billion to over $20 billion. As shown by the rank order data in Table VI.7, the largest firms were found in the petroleum industry and the smallest firms were found in the metals industry. No significant size difference was evident between the North American and Western European firms.

One of the largest firms received the lowest ecological incorporation score, while one of the smallest

received one of the highest scores. Size is not related to ecological incorporation by logical necessity. We hypothesized above that size could be a facilitator of innovative behavior by enabling the firm to reap the benefits of greater specialization. It could be that size of firm has little effect on innovative behavior such as ecological incorporation, at least when a firm is above some threshold size.[21] In addition, it could be that both small and large size have associated advantages and disadvantages for innovation. After an extensive review of innovation in industry, Utterback concludes: "No relationship was found between the size of a firm and its relative ability to innovate. Similarly, there is no evident relationship between firm size and speed of adoption of innovations. Larger firms appear to lead in some industries, while smaller and medium-sized firms lead in others."[22]

Company size was found to be significantly correlated (.4116, significant at the .10 level) with the dimension of formalization, as one would expect from bureaucratic theory. A large firm may be more visible and hence susceptible to public pressure for environmental protection, may have better access to low cost sources of environmental information, and may be able to attract more specialized environmental personnel. A small firm, however, may be able to respond more quickly to external change and may have less complex internal patterns of communication and decision

making. All of the characteristics just cited, for both large and small firms, could be conducive to environmentally innovative project planning behavior. On balance, it does appear that size exerts at least some mild influence. It does this primarily in an indirect fashion by influencing other organizational variables which are more strongly related to ecological incorporation.

9. Company Investment Intensiveness

A rank order correlation of .4252 (significant at the .03 level) was found between the relative size of a firm's current capital expenditure program and the extent of ecological incorporation embodied in its project planning process. The variables of company investment intensiveness was calculated by dividing each firm's average capital expenditures for the period 1971-1973 by its average total assets for the same period. The median investment intensiveness was .084 and the range extended from a low of .037 to a high of .132. Four MNCs had percentages below .07 and seven had percentages above .10. As shown in the rank order data presented in Table VI.7 no significant differences were found among the three industries on this variable, but many of the North American firms scored higher than the Western European firms, especially in the case of the chemicals industry.

Investment intensiveness is a measure of the amount of new and replacement capital project activity relative to the firm's existing asset base. In a crude sense it can be interpreted as a relativized indicator of the number of new projects being undertaken by the firm. It could be argued that the greater the number of new investment projects actively under consideration, the heavier would be the demands on the resources necessary for ecological incorporation such as top management time, environmental staff skills, and financial resources for environmental research. This might imply that the ecological incorporation embodied in any one project planning process would be inversely related to the number of new projects under consideration during the same time period. As was stated above, the opposite result was found in this study--investment intensiveness is strongly positively correlated on a zero-order basis with ecological incorporation.

The reasons for this finding are perhaps threefold. First, firms undertaking a great number of new projects during the "environmental awareness" years of 1971 through 1973 are perhaps the ones which have been most exposed to extraorganizational ideas of environmental planning. Second, undertaking more investment projects during the environmental years would imply a greater need for procedures and techniques of environmental analysis in order to successfully implement the projects. Third, rather than

placing a strain on a fixed level of resources for incorporation, it is more likely that the most investment intensive firms have greatly expanded the pool of resources in order to meet the higher demands. An investment intensive firm may thus be able to enjoy considerable economies of scale in the assembly of skills and resources needed for environmentally-oriented project planning. A specialized environmental staff can be built up, new control technologies can be developed, better investigatory and analytical procedures can be devised, and so on, because the costs of these "resource building" efforts can be spread over a wider number of new projects.

C. THE ORGANIZATIONAL SYSTEM

1. Organizational Variables in Combination

Table VI.8 provides an intercorrelation matrix of the organizational variables. As is evident from the many strong and significant rank correlations, the system of internal variables is a highly intercorrelated one. Partial correlation analysis is employed shortly in an effort to untangle the complex web of interrelationships, but an examination of some of the zero-order correlations provides a number of insights as to how the MNCs may have adapted in response to the issue of environmental protection.

The strongest correlation found in the entire matrix is between company investment intensiveness and EC external

TABLE VI.8

INTERCORRELATIONS AMONG ORGANIZATIONAL VARIABLES[a)]

	EC Role Assign-ment	EC Per-formance Msrmt.	EC Res. & Tech. Programs	EC Ext. Surveil-lance & Inter-action	Co. Profit-ability	Co. Size	Co. Investmt. Inten-siveness
EC objectives & top mngmt. commitment	.5385**	.4518**	.2287	.5934*	.5987*	.1858	.5987*
EC role assignment		.3279	.5842**	.6111*	.7723*	.5427*	.6471*
EC performance msrmt.			.4234***	.2928	.4071***	.2970	.4731**
EC res. & tech. programs				.1704	.5374**	.4002***	.2401
EC ext. surveil-lance & interaction					.5636*	.3549***	.7932*
Co. profitability						.3725***	.6863*
Co. size							.3725***

a) Kendall Rank Correlation Coefficients (tau); significance levels: * = .01 level, ** = .05 level, *** = .10 level.

surveillance and interaction, perhaps implying that the greater the practical need for environmental information (undertaking a greater relative number of new projects), the greater the effort to procure such information. Investment intensiveness is also strongly related to EC role assignment, providing some evidence of the economies of scale rationale discussed above. It is also interesting to note that the most investment intensive firms are usually also the most profitable, but not always the largest firms.

The role of company profitability is intriguing. We found above that it was only weakly associated with environmentally-oriented planning behavior. From Table VI.8, however, it is evident that profitability is more strongly correlated with all five aspects of EC organizational structure, especially with EC role assignment. This raises the question of whether high profitability leads to a well-developed internal structure of environmental management, or alternatively whether such a structure causes high profitability. It could very well be that the causality may run both ways.

The strong intercorrelations among the five EC organizational variables suggest that these five might form an "adjustment package." By this we mean that an adjustment in one variable, say objectives, will bring with it concomitant adjustment in the other variables. To pursue a strongly held set of EC objectives would seem to imply the

need for expertise (role assignment), information (external surveillance and interaction), technology (research and technology programs), and measurement of performance against the objectives (performance measurement). The three EC variables of objectives, role assignment, and external surveillance appear from the correlations to form the central underpinning of a firm's environmental management structure. The weaker correlations associated with the performance measurement and research and technology variables might imply that these are second-order structural adjustments.

In order to clarify the role of various organizational variables, a partial correlation analysis of the system was carried out and the results appear in Table VI.9. Of the eight variables, only three persist as being either moderately or mildly related to ecological incorporation after the effects of various control variables are removed. These three are EC objectives and top management commitment, EC external surveillance and interaction, and company size. The correlations between these three variables and ecological incorporation remain relatively strong no matter what other organizational variable is held constant. Viewed in the context of this one system then, the relationships appear to be genuine. We tentatively conclude that size is mildly related to, and that EC objectives and EC surveillance are both moderately related to, ecological incorporation independently of the other organizational variables.

TABLE VI.9

ORGANIZATION PARTIAL CORRELATION ANALYSIS[a)]

	Zero-order Correl. w/ Ecol. Incorp.	Partial Correlation with Ecological Incorporation Controlled for:				
		Co. Profitability	Co. Size	Co. Investmt. Intensiveness	EC Objectives & Top Mngmt. Commitment	EC Ext. Surveillance & Interaction
EC objectives & top mngmt. commitment	.6150	.6928	.5544	.3427	--	.3463
EC role assignment	.4351	.5558	.1960	-.0236	.1069	-.0509
EC performance msrmt.	.3547	.3003	.2620	.0575	-.1108	.1927
EC res. & tech. programs	.1523	.0396	-.0496	-.0189	-.0644	.0197
EC ext. surveillance & interaction	.6076	.6378	.4864	.3044	.3273	--
Co. profitability	.1980	--	-.0036	-.5118	-.4431	-.3107
Co. size	.4999	.4682	--	.3583	.4053	.3036
Co. investmt. intensiveness	.5529	.6831	.4395	--	.1202	.0366

a) Pearson product moment zero-order and first-order partial correlation coefficients.

The observed associations between the other five organizational variables and ecological incorporation appear to be either derived from spurious causes or reflective of other intervening variables. The correlations between these variables and the dependent variable all vanish (i.e., are dramatically reduced) when the effects of one or more other organizational variables are removed (i.e., held constant). EC objectives and EC surveillance appear to be the prime intervening variables or causes of the spurious relationships.

The strong correlation between company investment intensiveness and ecological incorporation disappears almost entirely when we control for either a firm's EC objectives or EC surveillance. This perhaps reflects not a spurious relationship, but one which is mediated by the two intervening variables of objectives and surveillance. In other words, it is likely that greater investment intensiveness necessitates greater surveillance and/or fuller EC objectives, which in turn leads to more environmentally-oriented project planning behavior. The same reasoning might apply to the observed association between company profitability and ecological incorporation. Although the zero-order correlation here was found to be rather weak, dramatic reductions occur when control variables are introduced. It could be that higher profitability allows a firm to more fully adopt EC objectives (i.e., by creating slack conditions)

and to engage more extensively in external monitoring, which in turn lead to higher ecological incorporation.

In contrast to investment intensiveness and profitability, the observed associations between the other three variables (EC role assignment, EC performance measurement, and EC research and technology programs) and ecological incorporation are probably not reflective of intervening variables, but are indeed spurious relationships. The vanishing partials between role assignment and incorporation when controlled for either objectives or surveillance leads one to believe that the observed moderate positive association results solely from the joint causal effect of objectives and/or surveillance on both role assignment and ecological incorporation. In a similar fashion, the observed small direct correlation between EC performance measurement and incorporation appears to result from the fact that measurement varies along with objectives, which may be the true predictor of ecological incorporation. Finally, the small positive correlation between EC research and technology programs and ecological incorporation appears to result from the joint causal effect of surveillance, objectives, and size on both those variables and hence is probably spurious.

To summarize, the above examination of relationships among the variables in the organizational system has revealed that the system is truly a highly interrelated one. Three

variables appear to be genuinely related to ecological incorporation and perhaps exert independent influence. EC objectives and EC surveillance seem to be moderately related and company size only mildly related. The effects of investment intensiveness and company profitability on ecological incorporation appear to operate primarily through the variables of objectives and surveillance. Three spurious relationships have been uncovered. The relationships of EC role assignment, EC performance measurement, and EC research and technology programs with ecological incorporation may be accounted for by the joint effects caused by variation in either objectives, surveillance, or size. These conclusions have been reached, however, only within the confines of the organizational system. The possible influence of variables in the other contextual systems must also be considered.

2. Organizational Variables in Relation to Project Nature and Public Policy

Table VI.10 provides a matrix of intercorrelations between the eight organizational variables and the five variables of the project nature system and the five variables of the public policy system. The associations between project nature system variables and organizational system variables have already been examined in the previous chapter. With the exception of a few interesting relationships, it was generally concluded that the two systems were independent

TABLE VI.10

INTERCORRELATIONS OF ORGANIZATIONAL VARIABLES WITH PROJECT NATURE AND PUBLIC POLICY VARIABLES[a)]

	EC Objectives & Top Management Commitment	EC Role Assignment	EC Performance Measurement	EC Research & Technology Programs
Project Nature System:				
Project type	.4030***	.1862	-.0736	-.1658
Project cost	.3256	.2263	-.0108	.0338
Project year	-.1556	-.5056**	-.0118	-.3323
Site location type	.3564	..4084***	.2406	.3553
Project ownership	-.2761	-.1015	-.2541	-.1807
Public Policy System:				
Home country envir. policy	.6758*	.2485	.2095	.0680
Host country envir. policy	.0000	-.1897	-.4556**	-.3811***
Public proj. examination	.0569	-.1265	-.1818	.0882
Proj. assoc. public pressures	.1270	-.0107	-.1579	-.0821
Envir. conflict experience	.3018	.2373	.2025	.0124

continued--

TABLE VI.10--continued

	EC External Surveillance & Interaction	Company Profitability	Company Size	Company Investment Intensiveness
Project Nature System:				
Project type	.3259	.1312	.0875	.2843
Project cost	.1852	.0966	.1353	.1353
Project year	-.3034	-.3483	-.2005	-.2639
Site location type	.2042	.4175***	.2144	.3272
Project ownership	-.0508	-.2503	-.3218	-.1788
Public Policy System:				
Home country envir. policy	.4472***	.3967***	.1634	.4668**
Host country envir. policy	.0738	-.2178	-.2970	-.0594
Public proj. examination	-.0805	-.2161	-.0432	-.2161
Proj. assoc. public pressures	.1605	-.1910	.1508	-.0302
Envir. conflict experience	.4068***	.1168	.3291	.3715***

a) Kendall Rank Correlation Coefficients (tau); significance levels: * = .01 level, ** = .05 level, *** = .10 level.

of each other. Close links between some of the project nature and host country public policy variables, however, were discovered. In a similar fashion, we have found the organizational system to be closely linked with public policy variables, but primarily in the home country.

An examination of the significant correlations in Table VI.10 reveals some interesting associations. MNCs based in home countries where the interest in environmental issues came earlier, public attention was more active, and governmental environmental management machinery was more comprehensive were generally more profitable and investment intensive. More importantly, however, firms based in these nations were also more fully committed to objectives of environmentally responsible behavior and were engaging in more EC-related external surveillance and interaction. This appears to indicate that the process of corporate institutionalization of the social issue of environmental protection is further advanced within those MNCs based in nations which are further along in the environmental protection "issue-attention cycle."

The negative correlations between host country environmental policy and most all of the organizational variables provides insight as to what kinds of firms were investing in what kinds of nations. It suggests that some of the firms investing in the nations furthest along in the attention cycle had relatively undeveloped environmental

management structures. Turned around, it implies that some of the firms possessing highly developed environmental management organizational systems were investing in nations furthest back along the cycle.

The strong association between the extent of environmental conflict experience and the extent of EC external surveillance and interaction is especially interesting. As the surveillance variable was measured currently, but the conflict variable measured experience over the last five years, one is strongly tempted to interpret external surveillance behavior as an adaptive organizational innovation induced by prior conflict created "performance gaps." An examination of partial correlations in the next chapter lends some support to this thesis.

In order to identify variables in the other two contextual systems which might be mediating in the relationships between organizational variables and ecological incorporation, a partial correlation analysis was performed. Table VI.11 shows the results of controlling the zero-order associations for the possible effects of various individual variables and groups of variables related to project nature and public policy. For all of the organizational variables except company size, the introduction of control variables does not significantly reduce the correlation coefficients. This implies that their relationships with ecological

TABLE VI.11

ORGANIZATION WITH ECOLOGICAL INCORPORATION PARTIALED ON PROJECT NATURE AND PUBLIC POLICY[a)]

Variable	Zero-order Correl. w/ Ecolog. Incorp.	First-order and Third-order Partial Correlations with Ecological Incorporation Controlled for: Proj. Year	Proj. Cost, Type; Site Type	Home Cntry. Envir. Policy	Envir. Confl. Exper.	Proj. Assoc. Public Pressures	Public Proj. Examination, Proj. Assoc. Public Pressures, Envir. Confl. Exper.
EC objectives & top mngmt. commitment	.6150	.6159	.5618	.6825	.5405	.7703	.7467
EC role assignment	.4351	.4308	.3256	.4270	.3497	.6759	.6390
EC performance msrmt.	.3547	.3799	.4650	.3333	.1790	.6923	.6392
EC res. & tech. programs	.1523	.1359	.3373	.1801	.1234	.3215	.3391
EC ext. surveillance & interaction	.6076	.6034	.5698	.6242	.4438	.7173	.6736
Co. profitability	.1980	.1807	.1190	.1643	.1700	.6900	.6673
Co. size	.4999	.5000	.4627	.4966	.2638	.2963	.0624
Co. investmt. intensiveness	.5529	.5464	.4573	.5580	.4525	.8821	.9027

a) Pearson product moment zero-order, first-order and third-order partial correlation coefficients.

incorporation are generally direct and do not run through intervening variables in the other systems.

The influence of size does appear to run partly through variables in the public policy system. When controlled for prior conflict experience, the association between size and ecological incorporation is reduced by half. Larger size appears to lead to more opportunities for conflict, which in turn leads both directly and indirectly to currently innovative ecological incorporation behavior. Larger size also appears to contribute to the intensity of project associated public pressures. Resistance to a project is typically much more intense when the firm responsible is known to be a "large and powerful" MNC. Company size thus has an influence on a MNC's past exposure to public demands in the form of conflict and to its current exposure to demands in the form of project-associated public pressures.

D. SUMMARY ON THE INFLUENCE OF ORGANIZATION

The organizational influence system within which project planning is carried out appears to both motivate and facilitate ecological incorporation behavior. Two variables in the system appear to stand out as being moderately and independently related to such behavior. One is the firm's EC objectives and top management commitment. Environmentally-sound project planning is most likely when

the MNC's objectives for environmental protection have been made formally explicit, expressed in leadership terms, applied globally, and backed by considerable top management support. A full commitment to the goal of environmental protection appears to be a necessary condition for ecological incorporation as well as for other organizational aspects of a firm's environmental management structure. Such a deep-seated commitment provides project planners with considerable guidance by clearly depicting a future state of affairs that the firm is striving to realize; it appears to restrain their freedom of choice by necessitating that the project be planned in accord with top management desires.

The other organizational variable which is moderately and independently related is that of EC external surveillance and interaction. Whereas EC objectives implies the presence of guidance, this variable implies the presence of resources. External surveillance of, interaction with, and internal dissemination of information about the actions and plans of "normative environmental protection reference groups" appears to facilitate the process and adoption of the ecological incorporation innovation. Such interorganizational interaction implies greater exposure to new ideas of advanced environmental planning, more feedback on the satisfaction and intentions of external groups, and greater access to the exponentially increasing body of research and knowledge concerning environmental impact. In short, it

allows the firm to build "anticipatory social awareness" into the process of project planning.

The three demographic variables of size, investment intensiveness, and profitability were each found to be exerting a mild and indirect influence. The mild observed association between company size and ecological incorporation appears to be chiefly reflecting the intervening effect of prior environmental conflict experience; that is, larger size typically results in more conflict, and this, in turn, in more incorporation in the current planning process. In a similar fashion, the observed correlation between investment intensiveness and the dependent variable appears to involve an indirect channel of influence running through both EC objectives and surveillance. Higher intensiveness appears to entail a greater need for current external surveillance in order to deal effectively with the greater relative exposure to "project-environment-public" interactions. Such higher exposure to modern demands for environmental protection appears to necessitate fuller adoption of deep-seated EC objectives. The somewhat weak association between relative profitability and incorporation probably works in the same way. Profitability breeds slack, which allows the firm to undertake more investment activity and provides the firm with the resources to monitor the external milieu and to adopt non-economic goals such as environmental protection. These "profit enabled" factors in turn appear

to directly induce environmentally-oriented project planning behavior.

In contrast with the associations found to be moderately independent or mildly indirect, the associations between incorporation and the three remaining variables of EC role assignment, EC performance measurement, and EC research and technology programs were deemed to be spurious. In all three cases, the observed correlations appeared to result from the joint causal effect of other variables such as EC objectives, EC surveillance, or size. EC role assignment, performance measurement, and research and technology programs may indeed all constitute valuable resources conducive for incorporation behavior. It is likely, however, that these three are of secondary importance in comparison to the influence exerted by strongly held environmental objectives and "anticipatory interdependence" with normative reference groups.

FOOTNOTES

CHAPTER VI

[1]See: Charles Perrow, "The Analysis of Goals in Complex Organizations," American Sociological Review, 26 (April, 1961), pp. 854-866.

[2]See: Harold W. Henry, Pollution Control: Corporate Responses (New York: AMACOM, 1974), and Richard A. Hopkinson, Corporate Organization for Pollution Control (New York: The Conference Board, 1971).

[3]The Dow Chemical Company, 1972 Dow Annual Report to Shareholders (Midland, Michigan: The Dow Chemical Company), p. 17.

[4]For a full exposition of this idea see: Carl A. Gerstacker, "Creating a Management Environment for Socially Reponsible Performance," in Melvin Anshen, ed., Managing the Socially Responsible Corporation (New York: MacMillan, 1974), pp. 41-58.

[5]For recent surveys of how major U.S. firms have organized for environmental management see: Leonard Lund, Corporate Organization for Environmental Policy Making (New York: The Conference Board, 1974) and Irvin Schwartz, "More of Management Moves into the Environment Picture," Chemical Week (Feb. 14, 1973), pp. 57-62.

[6]For another study which has also found evidence of this "life-cycle" phenomenon see: Robert W. Ackerman, "How Companies Respond to Social Demands," Harvard Business Review, 51 (July-August, 1973), pp. 88-98.

[7]For a discussion of how one MNC, E. I. DuPont de Nemours & Co., Inc., has organized for environmental management in Europe see: "DuPont's Environmental Men in Europe," Environmental Science and Technology, 8 (Feb., 1974), pp. 118-120.

[8]Yair Aharoni, The Foreign Investment Decision Process (Boston: Division of Research, Graduate School of Business Administration, Harvard University, 1966), p. 311.

[9]Section 311 paragraph (5) of the Act states that "any person in charge of a vessel or of an onshore facility or an offshore facility shall, as soon as he has knowledge of any discharge of oil or a hazardous substance from such vessel or facility in violation of paragraph (3) of this

subsection, immediately notify the appropriate agency of the United States Government of such discharge. Any such person who fails to notify immediately such agency of such discharge shall, upon conviction, be fined not more than $10,000, or imprisoned for not more than one year, or both." U.S. Federal Water Pollution Control Act (33 U.S.C. 1251, et seq., PL 92-500, Enacted by Congress October 18, 1972) Section 311, Paragraph 5.

[10]Ackerman, "How Companies Respond to Social Demands," p. 90.

[11]For a survey of the kinds of EC products and services being sold by U.S. chemical companies see: "Turning Their Problems into Profits," Chemical Week (Jan. 10, 1973), pp. 35-38. For reviews of the EC business of Dow and Union Carbide respectively see: "Interview: McKennon on Dow's ECS (Environmental Control System) Business," Environmental Science & Technology, 8 (June, 1974), pp. 495-497, and Joseph J. Fenley, "Ecologists' Target Also a Big Pollution Fighter," Industry Week (April 24, 1972), pp. 41-48.

[12]See: "Events Force Toxic Substances Issue," Environmental Science & Technology, 8 (May, 1974), pp. 408-409, and "Moving Toward Control of Toxic Chemicals," Business Week (May 11, 1974), pp. 112-114.

[13]See: "Industry's Latest Cancer Scare," Business Week (Feb. 23, 1974), pp. 100-101; "PVC Producers Gird for Battle Against Cancer," Chemical Week (April 3, 1974), pp. 31-33; and "The Spreading Fight Over Vinyl Chloride," Business Week (June 22, 1974), pp. 29-30.

[14]"Moving Toward Control of Toxic Chemicals," Business Week (May 11, 1974), p. 112.

[15]"Dow's Big Push for Product Safety," Business Week (April 21, 1973), pp. 82, 85.

[16]"Product Stewardship: Responsibility Never Ends," Chemical Week (Oct. 3, 1973), p. 45.

[17]Stichting CONCAWE, "What is CONCAWE?" (4th Revised Edition) report number 1/72 (The Hague: CONCAWE, Dec. 1972)

[18]CONCAWE, CONCAWE: The First Ten Years (The Hague: CONCAWE, 1973).

[19]"How They Found Vinyl-Cancer Link," Chemical Week (July 17, 1974), pp. 30-32.

[20]Indeed, many entrants into the EC business have found it to be unprofitable. Recent setbacks and dropouts indicate a "shakedown" has already begun. See: "Turning Their Problems into Profits," Chemical Week (Jan. 10, 1973), pp. 35-38.

[21]This has been suggested to apply to technological innovation. See: Edwin Mansfield, Industrial Research and Technological Innovation: An Econometric Analysis (New York: Norton, 1968).

[22]James M. Utterback, "Innovation in Industry and the Diffusion of Technology," Science, 183 (Feb. 15, 1974), p. 625.

CHAPTER VII

THE INFLUENCE OF PUBLIC POLICY

A. INTRODUCTION

The focus in this chapter is on relationships between environmentally-oriented project planning behavior and the public environmental policy systems in which firms operate. The public policy influence system is conceptualized as consisting of five variables: home country environmental policy character, host country environmental policy character, public project examination, project-associated public pressures, and environmental conflict experience. Three of these variables, host country policy, public examination, and public pressures relate specifically to the planned project, while the other two variables of home country policy and conflict experience relate to the firm's entire approach to environmental management. The variables are examined individually, in combination as an interactive system, and in relation to the other two contextual influence systems of project nature and organization.

Three of the policy variables were found to be at least mildly directly related to ecological incorporation; each was apparently exerting motivational influence.

Project-associated public pressure was found to be most strongly and independently related. Pressures for environmental protection exerted on the firm from governmental, citizen group, community, and media organizations appear to represent powerful stimulants to environmentally-oriented behavior. Such behavior is induced both in anticipation of expected pressures, and in reaction to actual "felt" pressures. Ecological incorporation was found to be positively, but more weakly, associated with the extent of public project examination. More time and energy is generally devoted to environmental issues in project planning when a firm knows that it will be subject to close public scrutiny on environmental grounds. Environmental conflict experience was found to be moderately related. Prior conflict episodes such as project delays or terminations, forced plant closings, adverse publicity, and litigation related to environmental questions appear to stimulate the search and adoption of the ecological incorporation innovation. Such conflict also appears to induce adaptation in a firm's organizational structure (i.e., objectives, role assignment, external surveillance) in terms of institutionalizing concern for environmental protection.

The two variables of home and host country environmental character were found to be very weakly directly associated with ecological incorporation. Important indirect relationships, however, were discovered.

Progressive home country policy appears to be partly responsible for determining whether a MNC has experienced considerable environmental conflict. It also appears to be a driving force which leads a firm to adopt deep-seated environmental objectives and to engage in extensive external surveillance of events and trends in the environmental field. Home country policy thus exerts its influence indirectly by affecting conflict experience, objectives, and external surveillance, each of which is strongly directly related to ecological incorporation. Host country environmental policy also plays an indirect role in that it partly determines the intensity of public pressures and the extent of public examination which are accorded to proposed MNC projects.

The public policy influence system thus appears to contain the principal motivators of environmentally-oriented project planning behavior. The system is actually made up of two virtually independent subsystems: the "home country policy-past experience system" and the "host country policy-current demands system." Ecological incorporation is stimulated by both subsystems, but in different ways.

B. THE PUBLIC POLICY VARIABLES

1. Correlations with Dimensions and Composite Index of Ecological Incorporation

Table VII.1 presents a matrix of rank correlations between the five public policy variables and the six

TABLE VII.1

PUBLIC POLICY--ECOLOGICAL INCORPORATION CORRELATIONS[a)]

	Home Country Environmental Policy Character	Host Country Environmental Policy Character	Public Project Examination	Project-Associated Public Pressures	Environmental Conflict Experience
Systematization	.2165	.1939	.5568	.5803*	.3064
Professional involvement	.2471	.1887	.4689**	.6067*	.3934***
Continuousness	.1131	.0640	.0698	.3464	.4572**
Inclusiveness	.0121	.3283	.4814**	.7084*	.2090
Public participation	.1337	.1444	.3601	.5655*	.4313**
Formalization	.3895***	.0746	.0349	.2814	.7886*
Ecological incorporation composite index	.2530	.1561	.4046***	.5648*	.4080***

[a)] Kendall Rank Correlation Coefficient (tau); significance levels: * = .01 level, ** = .05 level, *** = .10 level.

dimensions and composite index of ecological incorporation. Three of the external variables, project-associated public pressures, environmental conflict experience, and public project examination, were found to be strongly and significantly related on a zero-order basis to ecological incorporation. As revealed by their correlations with the dimensions, however, the strong associations with the composite were achieved through varying relationships with the component dimensions. Conflict experience was found to be most closely associated with formalization and continuousness, public pressure to inclusiveness and professional involvement, and public examination to systematization and inclusiveness. These varying relationships with the dimensions are explored in greater detail below. The variables of home and host country environmental policy were found to be only mildly and insignificantly associated with ecological incorporation. In contrast with the other two contextual systems of project nature and organization, we found all of the dimensions of ecological incorporation to be strongly correlated with one or more of the public policy system variables.

2. Home Country Environmental Policy Character

A moderate rank order correlation of .2530 was found between the character of a MNC's home country environmental policy and the extent to which it had incorporated

ecological considerations into its project planning process. One dimension of ecological incorporation, that of formalization, was found to be more strongly and significantly related to home country policy. Although the direct association between home country policy and project planning was found to be low, there were indirect relationships which were quite strong. Home country policy was strongly related to both EC objectives and EC external surveillance in a MNC, which in turn, as revealed in the previous chapter, appear to be closely associated with environmentally-oriented planning behavior. These indirect relationships are discussed in greater detail later in this chapter.

The measure of environmental policy character employed in reaching these conclusions (and the ones which follow under the host country section) represents a composite index constructed from twelve indicators relating to three dimensions of national environmental policy: 1) the extent of governmental intervention for environmental protection, 2) the amount of public attention to, and political salience of, issues of environmental protection, and 3) the duration of both governmental intervention and public attention. The environmental policy systems of the twelve nations involved in this study were surveyed, category sets were created, a common scoring system was applied, and a composite index was calculated. The twelve-nation survey of

environmental policy appears in Appendix D. The indicators employed and the ranking of nations which resulted appears in Exhibit VII.1. This rank order indicates, albeit rather crudely, the relative intensity of pressures for environmentally-oriented behavior exerted from the social, political, and insitutional settings of each nation. The pressures were deemed to be most intense in the United States and least intense in Mexico.

The home country origin of the fifteen intensively examined project cases is presented in Exhibit VII.2. Two-thirds of these project emanated from the three countries which received the three highest scores on the index of environmental policy character constructed in Appendix D: the United States, Sweden, and the Netherlands. With such a small number of home countries represented and with such little variance in the character of environmental policy between them, our discussion below can only be suggestive.

Projects by MNCs from the high scoring environmental policy nations were found at all levels of the ecological incorporation behavior spectrum. The projects by U.S.-based firms, for example, were found to be about equally divided over the "low," "moderate," and "high" incorporation clusters. As a general rule, the MNCs were not found to be fully mirroring the environmental ideals and values of their home countries in their projects abroad. At the same time, however, they were also not fully adapting to local

EXHIBIT VII.1

NATIONAL ENVIRONMENTAL POLICY CHARACTER
RANKING FROM APPENDIX D

Indicators Employed

1. Governmental Intervention in Environmental Protection
   a. National environmental protection ministry, department or agency
   b. Regional, provincial or state level environmental protection organization
   c. Comprehensive national environmental protection legislation
   d. Planning controls over new industrial development

2. Public Attention to, and Political Salience of, Environmental Protection
   a. Citizen environmental group strength and activism
   b. Citizen-industry environmental conflict
   c. News media attention and influence
   d. Environmental protection as a political issue

3. Duration of Governmental Intervention and Public Attention
   a. When national environmental protection ministry or agency was created
   b. When bulk of modern environmental legislation was enacted
   c. When take-off period in public interest occurred
   d. Historical concern factor regarding environmental protection

Ranking of Nations

Mexico	1	(lagging; pressures least
Iceland	2	intense)
Ireland	3	
Italy	4	
France	5	
Canada	6	
Australia	7	
United Kingdom	8	
West Germany	9	
Netherlands	10	
Sweden	11	
United States	12	(leading; pressures most intense

EXHIBIT VII.2

HOME AND HOST COUNTRY INFORMATION FOR FIFTEEN INTENSIVELY-EXAMINED PROJECTS

Home Country Origin	Overall Index of Environmental Policy[a]	Number of Projects
United States	11.0	8
Sweden	10.5	2
Netherlands	10.5	1
United Kingdom	9.0	2
Canada	8.0	2
Host Country Destination		
United States	11.0	2
Sweden	10.5	2
West Germany	9.5	2
United Kingdom	9.0	2
Australia	8.5	1
Canada	8.0	2
France	6.0	1
Ireland	4.0	1
Iceland	3.5	1
Mexico	2.0	1

Directional Flows	
From	To
United States	United States, West Germany, Australia, Canada, Ireland, Mexico
Sweden	Sweden
Netherlands	West Germany
United Kingdom	United Kingdom, France
Canada	United Kingdom, Ireland

[a] Calculated in Appendix D.

environmental requirements and priorities. In short, the environmental orientation exhibited in the planning process for overseas projects (almost always located in lower scoring environmental policy nations) appears to be less than one would expect from full behavioral extension, but more than one would expect from full behavioral adaptation. In other words, MNCs appear to incorporate less ecology into the planning of projects destined for lagging environmental policy nations than they do in the planning of projects for leading policy nations. But this level of incorporation for the "lagging" nation project is probably still higher than the level one would expect from an indigenous firm undertaking the identical project.

Partial evidence for this "mid-range" planning behavior finding (i.e., less than home country, but more than host country) was derived from an examination of multiple projects in some of the MNCs. It was also derived from the fact that the first environmental baseline surveys done in Australia and West Germany were done by U.S.-based MNCs in conjunction with two of the projects examined in this study. These two firms were truly innovators in the two host countries by virtue of applying techniques of environmental planning analysis which had been acquired in the context of previous projects in their home country. The environmental planning experience and know-how gained in the home nation gave these two firms a "competitive

advantage" over the indigenous firms of the host nation. The multinational corporation may thus represent an important mechanism in the transnational diffusion of environmental management ideas.

Three reasons may explain why a stronger relationship was not discovered between home country environmental policy and ecological incorporation. First, for the firms which are truly multinational in philosophy, staffing and operations, the concept of predominant home country influence may be anachronistic, if not totally irrelevant. Some of the firms in this study derived less than 50% of their sales from, and had less than 50% of their assets and employees in, their home country. A few had operations in over 100 countries. The behavior of these firms is not simply a function of the pressures exerted on them in the nation where they happened to originate, but is probably a function of some "weighted average" of the pressures exerted on them in all of the nations were they operate.

The second reason why a stronger correlation was not observed is that the index of national environmental policy may be too aggregated. The index only attempted to gauge the general character of environmental policy within a nation. Firms are more likely, however, to be influenced by the substance, intensity, and timing of environmental policy only as it specifically affects their operations. Evidence of the differential influence of policy is revealed

later in this chapter when we examine the interrelationships between public policy and organization. In short, public policy appears to have a greater influence when the firm is more open to such influence (EC external surveillance), when the firm is involved in more situations subject to such influence (investment intensiveness), and when the firm has directly experienced pressures for better environmental behavior (conflict experience).

The low correlation between home country environmental policy and ecological incorporation is possibly also explained by a third reason: the index measured only pressure for change, not the rate of change. The rapidity with which a nation gains interest in, formulates, and implements an environmental policy varies considerably. The United States and West Germany, for example, had late starts in the area, but reacted very quickly and forcefully when they finally recognized the need. In other nations such as Sweden, Canada, and the United Kingdom, the process has been much more gradual in nature. The rate at which a society attempts to solve its environmental problems, rather than the cumumlative amount of change, may be the more significant factor.

3. Host Country Environmental Policy Character

The rank order correlation between ecological incorporation and the character of host country environmental

policy was found to be only .1561, even weaker than the home country association. Host country policy was found, however, to be moderately associated with the dimension of inclusiveness (i.e., correlation of .3283 significant at the .11 level). As shown in Exhibit VII.2, the fifteen intensively-examined project cases were scattered over ten different host countries which ranged widely in the character of their environmental policies. The home country--host country directional flow of the projects is also presented in this exhibit. Nine of the projects were going to nations whose environmental policies scored lower, five were staying in the home nation, and only one was going to a higher-scoring nation. The ecological incorporation of projects being located in high scoring nations showed no consistent pattern; some received low ecological incorporation scores and others achieved high scores. The scores of projects being located in low-scoring nations (principally chemicals projects), were generally of a low or moderate level.

There are many possible reasons why ecological incorporation was found to be only weakly associated with the index of host country environmental character. Most of these relate to the incomplete and aggregate nature of the index. An examination of these factors reveals much about the complexities involved in gauging the influence of public policy on organizational behavior.

The index of host nation environmental policy did not fully reflect the compliance structures at work in each nation.[1] It did not gauge the effectiveness of enforcement,[2] the potentials for loophole exploitation,[3] the seriousness with which the national agency had accepted its mandate,[4] the possible understaffing or underfinancing of the national agency,[5] the degree of rigor in the environmental standards applied,[6] the extent of governmental assistance such as grants and rapid accelerated depreciation for pollution control investment,[7] the possibility that the environmental regulatory agency may be overly sympathetic to the regulated firms,[8] and so on.

Neither did the index measure the propensity of some nations to formulate and implement ad hoc environmental policy in a piecemeal fashion for particular industrial projects. In one of the metals projects examined in this study, the government imported outside environmental consultants to design the set of conditions which would be applied to the project. One of the large chemical projects induced a state government to create an environmental agency just to handle that one project. A few executives mentioned that in countries such as Spain and Italy, industrial projects are subject to unexpected "pouncings" when the government finds it politically expedient. Expectations of such erratic behavior, other induced uncertainties, and expectations of future environmental policy measures could

be important factors in explaining moderate or high ecological incorporation when the current national policy is relatively undeveloped.

Besides being incomplete, the index apparently needed to be more project- and location-specific. Attempts to measure the influence of environmental policy at the national level can produce misleading results, because tremendous regional and local variations exist in environmental policies within most nations. For example, ecology-growth perceptions and trade-offs appear to differ widely between the provinces of Ontario and Quebec in Canada, the states of Victoria and South Australia in Austrailia, the northeast and south of the United States, the states of Nordrhein-Westfalen and Bremen in Germany, and even between the eastern and western provinces of the Netherlands. Even where the environmental law is nationally promulgated, the interpretation and enforcement typically varies by region or locality. Under the same national air pollution control law in West Germany, for example, a new refinery in one state was recently allowed 3.1 tons of SO_2 per hour maximum, while in another state a new refinery was allowed only 2.0 tons SO_2 per hour maximum. The activism of citizen environmental groups may also vary interregionally within a nation. In many of the nations included in this study citizen group activity was found to be concentrated in certain geographical pockets or "hot beds;" firms located

in these regions were more likely to receive the focus of environmental group attention than firms located elsewhere in the country.

In short, the process of guaging the influence of national environmental policy on a firm's project planning behavior must systematically take into account the full set of incentives and disincentives operative within the policy system. The analysis must also be project- and location-specific given the tremendous inter-industry and inter-regional diversity in the substance and intensity of policy measures in most nations. Unless this is done, the results of a policy impact analysis are likely to be misleading due to problems of omission and aggregation.

4. Public Project Examination

A moderate zero-order rank order correlation of .4046 was found between the extent of public project examination and the extent of environmentally-oriented MNC project planning behavior. As shown in Table VII.2, three indicators were combined to form an index of public project examination: a) whether public hearings were required, b) whether an environmental impact statement was required, and c) whether planning permissions and/or discharge approvals were required. The constructed index was found to be most closely associated with the three dimensions of systematization, inclusiveness, and professional

TABLE VII.2

INDEX OF PUBLIC PROJECT EXAMINATION[a)]

	Public Hearings Were Required	Environmental Impact Statement Was Required	Planning Permissions and/or Discharge Approvals Were Required	Index of Public Project Examination
Polyethylene Plant	no (0)	no (0)	yes (1)	1.0
Aluminum Smelter Expansion	yes (1)	no (0)	yes (1)	2.0
Oxygen Steel Plant Expansion	yes (1)	no (0)	yes (1)	2.0
Ferrosilicon Smelter	no (0)	no (0)	partly (.5)	0.5
Polypropylene Plant	no (0)	no (0)	yes (1)	1.0
Hydrofluoric Acids Plant	no (0)	no (0)	partly (.5)	0.5
Aluminum Smelter	yes (1)	no (0)	yes (1)	2.0
Alumina Extraction Plant	yes (1)	partly (.5)	yes (1)	2.5
LNG Import Terminal	yes (1)	yes (1)	yes (1)	3.0
Ore Mining Development	no (0)	no (0)	yes (1)	1.0
Steelworks Modernization	yes (1)	no (0)	yes (1)	2.0
Natural Gas Pipeline System	yes (1)	partly (.5)	yes (1)	2.5
Offshore Oil Complex	yes (1)	no (0)	yes (1)	2.0
Petrochemical Complex	yes (1)	yes (1)	yes (1)	3.0
Petroleum Refinery	yes (1)	no (0)	yes (1)	2.0

[a)] Category sets for indicators appear in Appendix E.

involvement. On average, the extent of public examination was not significantly different for the projects of U.S. and non-U.S. MNCs, but did vary widely among the three industries. The petroleum-gas projects received the greatest public examination, the metals projects slightly less, and the chemical projects usually much less.

Public interest hearings were required in two-thirds of the project cases. Some of these were demanded by governmental agencies due to the nature or size of the project. Others were initiated when citizen objections were raised against the project. The character of the hearings varied widely from nation to nation in terms of the mix of pleading, adjudicatory, and fact-finding activities entailed in the proceedings. Some were informally-run meetings, while others were formal affairs with rules providing for examination, cross-examination, and re-examination of witnesses as in a court of law. Most of them lasted only one or two days; one, however, was expected to last well over a year and to involve dozens of lawyers, hundreds of witnesses, and thousands of pages of documentary materials.

The public hearing held in conjunction with the petroleum refinery project is typical of the ones encountered in this study. In this case the refinery was by law subject to governmental licensing on both construction and emissions. The application, accompanied by a description of the proposed facility, blueprints, and environmental

control plans (in all amounting to a document as thick as a telephone book), was made available to the public at the community's city hall. Announcements of the application were made in the local newspapers and the public was given a period of fourteen days in which to raise objections. A total of 4,300 people made objections, mostly by means of signing mass-circulated petitions. The firm was required by law to send 4,300 invitations to the public hearing, which was to be held in several months. A report representing the firm's views on all of the various environmental objections that had been raised was written during that time. Representatives of the firm were able to persuade the chairman of the hearing to organize the proceedings along the lines of the report. Four hundred and fifty people attended the hearing, which lasted from 9 A.M. to 10 P.M. By 4 P.M. many of the citizens had left, but the "hard core" of the environmental objectors stayed until the very end. When the hearing was over, all parties generally agreed that the proceeding had been handled objectively and efficiently. All costs resulting from the hearing were by law borne by the firm. In addition, the burden of proof that the project would not be harmful was placed fully on the firm. The community authorities took two months to decide whether the refinery would result in substantial disadvantage, danger, of inconvenience to persons living on neighboring property or to the general

public. They decided that adequate provisions had been made to protect the environment and thus granted the firm its license.

Various problems of efficiency and equity were observed in some of the public hearing processes examined in this study. In a few instances they appeared to be unnecessarily costly, tedious, and time consuming. In the case of the natural gas pipeline project, for example, three sets of extensive hearings, sponsored by different federal agencies on different aspects of the project, were expected to consume in total about two years of time and effort. Such an elaborate and fragmented system was viewed by the project executives as a "planning nightmare" in terms of the associated legal costs, political complications, time delays, and induced uncertainties. This elaborate system of hearings was also seen as being long and expensive for public interest groups. The barriers to citizen participation in public hearing processes are often formidable. "Such interests may not participate because of the frequently enormous expense involved, a lack of organization to represent their interests, a lack of knowledge or inaccurate knowledge about the impact of the project, feelings of inefficacy about participation, certain legal difficulties that prevent them from entering, and so on."[9]

Most of the public hearings took place at a rather late stage of the project planning process, typically after

positions on the part of both the applicant firm and objecting interest groups were already hardened. The primary stance adopted by most of the firms in these hearings was defensive in nature. Project planning executives commonly viewed these proceedings as unpleasant exercises to either be avoided or completed as quickly as possible and at minimum cost in terms of company time, legal fees, and future options. A common tactic was to confront the public with a fait accompli after having amassed extensive evidence for the one position. Many of the firms had almost a virtual monopoly over the supply of authoritative information; citizen group and governmental investigations were often perfunctory or nonexistent due to the lack of resources. In spite of these above limitations, it appears that a required airing of environmental impact issues via a public hearing is a rather powerful force which motivates firms to incorporate ecological considerations into their project planning efforts. It appears that when a firm knows that it will have to articulate and disclose the basis of its environmental impact judgments in a public forum, more time and effort will generally be devoted to these issues during the planning process.

Predictive environmental impact statements were required by law, as shown in Table VII.2, in only two of the project cases. In another two projects, predictive statements were not required but comprehensive descriptive

pre-project environmental baseline surveys were. One of the required statements had the following table of contents:

1. Report Summary
2. Description and Purpose of Project
3. Environmental Description
   A. Air Resources
   B. Aquatic Environment
   C. Terrestrial Environment
   D. Noise Environment
   E. Socio-economic Environment
   F. Hazards
4. Beneficial and Unavoidable Adverse Impacts
5. Alternatives
   A. Project Alternatives
   B. Site Alternatives
6. Relationships Between Local Short-Term Use and Maintenance Enhancement of Long-Term Productivity
7. Irreversible or Irretrievable Commitments of Resources
8. References
9. Appendix

The requirement of a written impact statement or baseline study seems to be positively associated with the amount of detailed environmental information present in a project planning process. But the impact statement process, as the public hearing process, also has limitations. As one observer recently noted: "the process of preparing an environmental impact statement is not well understood and it's frightening to some. Those who have been through it have had lots of headaches, but they've ended up with better projects."[10] The impact statements written to date, including those examined in this study, have generally suffered from one or more of the following kinds of inadequacies: self-serving bias in the presentation, confusing organization

of the information, padding with massive amounts of information of indirect relevance, technical "window-dressing" to give an aura of validity, omissions of information on significant impacts, superficial analysis of adverse impacts and alternatives, little or no attempt at systems level description, and so on.[11]

Planning permissions partially concerned with environmental factors and/or specific pre-project discharge approvals were required for most of the projects (see Table VII.2), and the process of attaining approvals often entailed public hearings. In other cases, the permissions were granted solely on the basis of government agency-applicant negotiations that included no public review. The project in France, for example, was granted planning and emissions permission (in the form of a prefectoral arrêté) on the basis of a series of meetings and communications between the company and the local prefect. In comparison, the projects in the United Kingdom and Ireland received from the local authorities planning permission, subject to extensive effluent and emission conditions, only after extensive required public hearings were held.

The number of permits or approvals required, especially for the larger projects, was quite large. The LNG import terminal project, for example, needed twenty-four separate governmental permits from a variety of federal, state, county, and city agencies. Some of the project

aspects on which permits were required included: site plan approval, sanitary waste discharge, factory construction, wetlands alteration, construction on riparian lands, construction and operation air pollution control equipment, industrial waste discharge, water pollutant discharge, shipping, dredging, and importation of LNG. The process of getting the necessary permits, especially in cases such as the LNG import terminal, can be long, expensive and complicated for a firm. Fragmenting a project into a number of isolated environmental questions, rather than treating the entire bundle of project actions as one single environmental question, can also be dysfunctional from the standpoint of effective and expeditious public review. Once a few permits on various aspects of a project are granted, a "snow balling" effect may emerge; more and more weight may be given to the argument that "since the project has already been given clearance by these agencies, we might as well give ours."

Firms often find themselves assuming the role of a broker among overlapping jurisdictions of environmental control agencies. The Weyerhaeuser Co., for example, found itself bogged down in this role a few years ago while dealing with four agencies in planning its Longview, Washington facility. Through attempts to get out of this coordinating role, Weyerhaeuser was able to develop a "team concept" (probably the first in the United States) for joint planning by the company and all the concerned agencies.

Weyerhaeuser was unable to get what it wanted (a "one-stop" permit for construction and operation), but it was able to achieve coordinated agreement among all the parties concerning the facts of plant operation and waste volumes, and joint plans for satisfying requirements.[12] "One-stop," "team concept," and "total project" regulatory decision-making may represent a promising solution to the problems created by existing fragmentation in governmental project review procedures.

Public environment impact examination , as specifically applied to the project, was found to be more strongly positively associated with ecological incorporation than was the influence of generalized national environmental policy. In short, industrial project planning behavior is more likely to be environmentally-oriented when the host government (at all levels) has instituted mechanisms for ensuring a "public interest perspective" in the process of industrial development. With greater public scrutiny possible, firms appear to devote more effort to the consideration of environmental objections that might be raised. Required full disclosure of project plans appears to increase the amount of attention given to environmental impacts of proposed actions.

5. Project-Associated Public Pressures

A very strong rank-order correlation of .5648 was found between ecological incorporation in the project planning process and the intensity of project-associated public pressures for environmental protection. As shown in Table VII.3, five relative indicators were combined to form an overall index of project-associated public pressures: a) stringency of demands for environmental control from governmental agencies, b) level of opposition from citizen environmental groups, c) level of opposition from general community, d) extent of unfavorable local press treatment, and e) extent of previous opposition to similar projects in the same locality. Just as was found in the case of public examination, the intensity of public pressures did not vary on average for the U.S. versus non-U.S. corporate based projects, but did vary widely on an industry basis. Public pressures were found to be most intense in the case of the petroleum projects, slightly less intense for the metals projects, and generally least intense in the case of the chemical projects. The intensity of public pressures was found to be strongly associated with four dimensions of ecological incorporation: inclusiveness, professional involvement, systematization, and public participation.

The demands for stringent environmental control measures made by relevant governmental agencies were especially high in nine of the projects, moderate in another

TABLE VII.3

INDEX OF PROJECT-ASSOCIATED PUBLIC PRESSURES[a)]

Project	Stringency of Demands for Environmental Control from Governmental Agencies	Level of Opposition from Citizen Environmental Groups	Level of Opposition from General Community
Polyethylene Plant	high (1)	low (0)	low (0)
Aluminum Smelter Expansion	high (1)	medium (.5)	low (0)
Oxygen Steel Plant Expansion	high (1)	low (0)	low (0)
Ferrosilicon Smelter	medium (.5)	low (0)	low (0)
Polypropylene Plant	medium (.5)	low (0)	low (0)
Hydrofluoric Acids Plant	low (0)	low (0)	low (0)
Aluminum Smelter	medium (.5)	low (0)	medium (.5)
Alumina Extraction Plant	high (1)	medium (.5)	medium (.5)
LNG Import Terminal	high (1)	medium (.5)	medium (.5)
Ore Mining Development	medium (.5)	medium (.5)	low (0)
Steelworks Modernization	high (1)	medium (.5)	low (0)
Natural Gas Pipeline System	high (1)	medium (.5)	high (1)
Offshore Oil Complex	medium (1)	medium (.5)	medium (.5)
Petrochemical Complex	high (1)	low (0)	medium (.5)
Petroleum Refinery	high (1)	high (1)	high (1)

continued--

TABLE VII.3--continued

Project	Extent of Unfavorable Local Press Treatment		Extent of Previous Opposition to Similar Projects in Same Locality		Index of Project-Associated Public Pressures
Polyethylene Plant	low	(0)	low	(0)	1.0
Aluminum Smelter Expansion	low	(0)	low	(0)	1.5
Oxygen Steel Plant Expansion	low	(0)	medium	(.5)	1.5
Ferrosilicon Smelter	low	(0)	low	(0)	0.5
Polypropylene Plant	low	(0)	low	(0)	0.5
Hydrofluoric Acids Plant	low	(0)	low	(0)	0.0
Aluminum Smelter	low	(0)	medium	(.5)	1.5
Alumina Extraction Plant	medium	(.5)	medium	(.5)	3.0
LNG Import Terminal	low	(0)	high	(1)	3.0
Ore Mining Development	low	(0)	high	(1)	2.0
Steelworks Modernization	medium	(.5)	high	(1)	3.0
Natural Gas Pipeline System	medium	(.5)	high	(1)	3.0
Offshore Oil Complex	low	(0)	high	(1)	2.5
Petrochemical Complex	low	(0)	high	(1)	2.5
Petroleum Refinery	medium	(.5)	high	(1)	4.5

a) Category sets for indicators appear in Appendix E.

five, and rather low in only one. A few of the projects became "test cases" for the governments' new found concerns for environmental protection. The petrochemical complex project, for example, was viewed by both the newly-formed state level and national level environmental protection agencies as an opportunity to forcefully and publicly demonstrate their newly-acquired control powers. This "test case" phenomenon was also evident in the polyethylene plant, alumina extraction plant, and petroleum refinery. The stringency of governmental environmental control demands was not always positively correlated with the extent of citizen group and community opposition. In many of the cases, the stringent governmental demands were exerted only from national level agencies, not from local agencies. The stringency of demands made on a project, and intensity of resistance to the project, appeared in these cases to vary directly with distance away from the exact site location.

A few well-known cases of extreme "test case" governmental stringency have been widely reported in the literature. A good example is the attempted petrochemical complex project near the famous Hilton Head Island resort area in South Carolina by the West German chemical firm BASF in 1970. As viewed by one European observer, the story of BASF in South Carolina involved a foreign company which was trying to open up previously undeveloped country,

and was hit by the Americans' new-found concern with the environment.[13] The dispute over the location of the plant raged at the local, state, and even national levels for over a year.[14] An effective coup-de grâce to the project was administered in March of 1970 by the intervention of the then U.S. Secretary of the Interior Walter Hickel. On March 26, 1970 Hickel wrote an unprecedented letter to Hans Lautenschlager, the president of BASF, saying in part:

> The area in question is a splendid estuary, virtually free of pollution. . . . Our scientists and engineers advise that it is technically feasible to construct a plant with no effluent. This would completely protect the existing water quality of the area. This Department would strenuously oppose any action which would result in degradation of that water quality. . . . Construction of proposed navigation channels to serve your plant could damage the estuarine environment by destroying fish and wildlife habitats. . . . This Department will oppose strenuously any proposal for channel dredging which would cause environmental damage or which would cause a signficant increase in environmental hazards.[15]

The long and acrimonious battle between the Shell Oil Company and the state of Delaware over plans for a $200 million refinery on a 6,000 acre site is another well-known example of "test case" governmental stringency. In this battle, the proposed Shell project became a central debate in an emotional environmental issues-oriented gubernatorial election in the state. The then Governor of Delaware, Russell W. Peterson (now Chairman of the U.S. Council on Environmental Quality) campaigned vigorously

against the project. He declared at one point:

> As far as I'm concerned, even if Shell can build a plant 100 percent free of pollution, I'm still opposed. . . . Jobs are very important to our people, but so is the overall quality of life . . . we can afford to be selective.[16]

The controversy over the project precipitated the passage of Delaware's 1971 Coastal Zone Act, which bans heavy industry such as refineries, paper mills and steel mills from a strip about two miles wide along the state's coast (i.e., where Shell's property is located). Shell attempted to divorce itself from the emotional election controversy by publishing the following statement in Delaware's major newspaper:

> A Statement of Fact by Shell Oil Company:
>
> Over the past several months Shell Oil Company, much against its wishes, has been injected into the controversies concerning this year's gubernatorial campaign in Delaware. We have not made any statements in Delaware during the recently concluded Primary campaign because we did not want to be put into the position of having our remarks misinterpreted as any part of that campaign.
>
> However, now that the Primaries are concluded, we would like to point out that Shell has diligently refrained from playing any role in that campaign. I can say flatly that Shell has not endorsed or supported any candidate, and that it has not worked against any candidate. In addition, the Company has not contributed any of its money, or any of its people's time or efforts, in support or opposition to any candidate in these campaigns. I can also say flatly that Shell will follow the same course of action in the upcoming Fall elections. I sincerely hope that his will end once and for all any speculation as to Shell's position with regard to the elections.

> With regard to our property in New Castle County, I wish to reiterate that Shell has been blocked from going ahead with any plans for the construction of a refinery by the enactment of the Delaware Coastal Zone Act. Consequently, the Company is not planning to construct a refinery at that location. We also have no plans to test the constitutionality of the Coastal Zone Act. We continue to hold onto our Blackbird Hundred property because we have invested significant sums of money in purchasing this site over the past 12 years, and we are now engaged in evaluating the best economic uses for that property, compatible with State and County zoning and environmental considerations.
>
> I repeat, Shell Oil Company is not a participant, and hopefully is no longer a purported "issue," in any political campaign in the State of Delaware.
>
> John W. Sheehan
> Vice President, Manufacturing
> SHELL OIL COMPANY
> Houston, Texas[17]

Shell had invested very substantial sums of money in the property, environmental studies, and facilities planning over the ten-year period prior to 1971. Shell's actions, after the Coastal Zone Act resulted in the absolute prohibition of the facility, were recently reported by its Delaware attorney:

> Faced with the prospect of extensive litigation to challenge the validity of the arguably invalid provisions of the act, or awaiting a long-term shift in the pendulum of hysteric public opinion generated by Mr. Peterson's shameful and disreputable "To Hell with Shell" campaign, Shell naturally chose not to exacerbate the then clearly inhospitable climate in Delaware. Accordingly, in order to meet anticipated long-range East Coast energy supply requirements, Shell was forced to seek an alternate site in the Delaware Valley, and has acquired property along the Delaware River in New Jersey, in the vicinity of Bridgeport approximately opposite Claymont, in an area having

> somewhat the same characteristics as its Delaware site. Shell is now proceeding with the necessary New Jersey and federal permit applications and environmental baseline studies and impact statements, and has received certain tentative approvals.[18]

Turning now from governmental demands to citizen demands, not many of the projects were found to be vigorously opposed by citizen environmental groups (see Table VII.3). The only project that was confronted with a relatively high level of citizen group protest activity was that of the petroleum refinery. In this case, the firm had to leal with two well-organized local citizen groups and various efforts on the part of national level groups to stir up local citizen opposition. The two local groups were primarily responsible for gathering the names of 4,300 objectors to the project prior to the public hearing. In seven other projects the level of citizen group activity was almost nonexistent; another seven encountered only minor protest activity. In a few of these latter cases, the protest was directed more at governmental inaction rather than proposed corporate action. In the case of the alumina extraction plant, for example, the national conservation group directed much of their protest towards the government, in trying to make the point that effective institutional arrangements for controlling such industrial activity had not been created. National environmental groups protesting one of the chemical projects which was located in a

governmental industrial zone neglected the firm, but directed all of their efforts to accusing the government of creating a policy of "reckless industrialization." In still another case, that of the offshore oil complex, the disapproval by the environmental groups was also directed primarily at the government for following a "full-speed-ahead-no-matter-what policy of energy self-sufficiency."

In a fashion similar to that of environmental group opposition, significant community-wide opposition was observed in only a few project cases. In the petroleum refinery project, the firm had to deal not only with two well-organized citizen groups, but also with a political party oriented totally to issues of environmental protection. This "environmental party" had recently captured ten percent of the popular vote in the region and had won four seats on the local city council. The inroads of this political party forced the other political parties in the region to direct more attention to environmental issues. In this political atmosphere the proposed refinery project easily generated widespread community opposition.

Community social and political objections to projects were often disguised in the form of environmental objections. In the case of the alumina extraction plant, for example, many of the local objectors were apparently more concerned with the importation of foreign construction labor and possible erection of shanty towns, than with

truly ecological impacts. The vociferous protests by local residents on sometimes frivolous ecological grounds, were viewed by the planning executives, as more "socially-acceptable" covers for the social impact fears that formed the true basis of concern. Issues of nationalism and imperialism were also translated into "ecological protest covers" in the petroleum refinery, petrochemical complex, and natural gas pipeline projects.

Rather than objecting to the proposed project, the recipient communities in five of the projects exhibited support for the project. The community in which the steelworks modernization was located (a steel-coal "monoculture,") was largely concerned not with environmental impact questions, but with whether the steelworks would remain open. The aluminum smelter project was welcomed as a new source of jobs for a depressed industrial region. Likewise, the communities associated with both the aluminum smelter and oxygen steel plant expansions were more concerned with gaining opportunities for employment in their essentially one-factory towns than with issues of environmental quality.

The local press treatment of most of the projects was generally not unfavorable (see Table VII.3). The only projects which experienced unfavorable coverage were the petroleum refinery, natural gas pipeline, steelworks modernization, and alumina extraction plant. Even in these four, however, the unfavorable treatment was not viewed by

the project executives as being particularly aggressive or persistent. Some wild scare articles appeared in connection with the alumina project such as "the plant will cause people to become sterile," and "SO_2 will affect people's health some 35 miles away." Favorable press treatment was given to both the aluminum smelter and oxygen steel plant expansion projects on the basis of the creation of new jobs.

Many of the firms, as shown in Table VII.3, had prior warning of possible intense public pressure in the site community, because of previous instances of strong opposition to similar industrial projects in the same region. In the ore mining development, for example, the project executives knew that the sister ore mine had become known as an acknowledged scar on the landscape and realized that they "were sitting on a powder keg of public opinion directed against the mining industry in that area." The natural gas pipeline project planners were provided with plenty of evidence of potential strong opposition. As the firm's environmental control director expressed: "I didn't want another Aleyska affair--they didn't do their homework, ignored legal and environmental counsel, and woefully underestimated the power of N.E.P.A." The opposition experienced in the petroleum refinery case was a direct repercussion of a previous environmental controversy in the same city. Six months prior to the firm's announcement of the project, a factory on a neighboring site was discovered to

be dumping mercury and emitting clouds of chlorine. It was out of this incident that the two citizen pressure groups and environmental political party formed.

Our review of five indicators of project-associated public pressure has revealed that the greater the amount of pressure for environmental protection exerted on the firm, the greater will be the extent of ecological incorporation embodied in the project planning process. This is especially true when the groups advocating environmental interests possess an intense commitment and a high level of resources available for advocacy. Massive and resolute advocacy of environmental interests has sometimes resulted in project abandonments, such as the Shell refinery and BASF petrochemical complex projects reviewed above. In other cases it has led to long project delays such as in the case of the Aleyska Trans-Alaska Pipeline and ESSO-BHP Australian ethane pipeline projects reviewed in Appendix D. In general, however, intense citizen or governmental advocacy of environmental interests usually does not kill or seriously delay industrial projects. It does, however, induce firms to devote greater efforts in project planning to the consideration of environmental impacts. Ecological incorporation is apparently induced both in anticipation of, and in reaction to, project-associated public pressures. The following comment of Hugh Goerner, Vice President of Producing for Exxon, sums up the role of public pressure

in project planning: "They (environmentalists) have pushed us into doing things that we probably should have done anyway."[19]

6. Environmental Conflict Experience

A fairly strong rank correlation of .4080 (significant at the .052 level) was discovered between the extent of ecological incorporation and the extent of conflict over environmental issues experienced by the firm during the five years prior to the project. Four indicators were combined to form an overall index of environmental conflict experience (see Table VII.4). These included the extent to which the firm had: a) experienced serious delays or terminations in previous projects for environmental reasons, b) been required to close down existing plants for environmental reasons, c) experienced adverse environmental publicity, boycotts and demonstrations, and d) been involved in serious environmental litigation. The scores attained on the overall index were not, on average, significantly different on the basis of continental origin of the MNCs, but did vary considerably on the basis of industry. The petroleum firms on average had experienced the greatest amount of previous environmental conflict, the chemical firms slightly less, and the metals firms least of all. The extent of conflict experience was found to be most

TABLE VII.4

INDEX OF ENVIRONMENTAL CONFLICT EXPERIENCE[a)]

Firm	Serious Delays or Terminations in Previous Projects for Environmental Reasons	Forced Closings of Existing Plants for Environmental Reasons	Adverse Environmental Publicity, Boycotts and Demonstrations	Involvement in Serious Environmental Litigation	Index of Environmental Conflict Experience
NAC 1	medium (.5)	high (1)	high (1)	high (1)	3.5
NAC 2	medium (.5)	low (0)	low (0)	medium (.5)	1.0
NAC 3	low (0)	low (0)	low (0)	low (0)	0.0
NAC 4	low (0)	high (1)	high (1)	high (1)	3.0
WEC 1	high (1)	high (1)	high (1)	medium (.5)	3.5
WEC 2	high (1)	medium (.5)	high (1)	low (0)	2.5
WEC 3	medium (.5)	low (0)	medium (.5)	low (0)	1.0
WEC 4	medium (.5)	high (1)	high (1)	high (1)	3.5
NAM 1	low (0)	low (0)	low (0)	low (0)	0.0
NAM 2	medium (.5)	medium (.5)	medium (.5)	low (0)	1.5
WEM 1	high (1)	medium (.5)	high (1)	high (1)	3.5
WEM 2	medium (.5)	low (0)	medium (.5)	low (0)	1.0
NAP 1	high (1)	low (0)	medium (.5)	high (1)	2.5
NAP 2	high (1)	medium (.5)	high (1)	high (1)	3.5
NAP 3	medium (.5)	low (0)	medium (.5)	medium (.5)	1.5
WEP 1	high (1)	low (0)	high (1)	high (1)	3.0
WEP 2	high (1)	medium (.5)	high (1)	high (1)	3.5

a) Category sets for indicators appear in Appendix E.

NAC = North American Chem. WEC = Western European Chem.
NAM = North American Metal WEM = Western European Metal
NAP = North American Petro. WEP = Western European Petro.

strongly correlated with the dimensions of formalization, continuousness, and public participation.

Seven of the MNCs had experienced serious delays or terminations in previous projects because of environmental objections. Examples of such delays or terminations drawn from the press include Aleyska Pipeline Service Co.'s five-year delay of the Trans-Alaska pipeline;[20] Veba Chemie's long wait for its license to construct a refinery at Rheinsberg;[21] Progil's blocked carbon disulfide plant near Amsterdam;[22] and the thwarted attempts described above by Shell and BASF to build a refinery in Delaware and a petrochemical complex in South Carolina, respectively. As shown in Table VII.4, fourteen of the seventeen firms surveyed in this study had experienced one or more major delay or termination episode. The seven firms receiving scores of high were ones in which either more than one episode had been experienced, or the one episode had been particularly traumatic. As one European metals executive expressed: "The battle over that project represents a dark chapter in our company's history." Most of these episodes involved conflictful interactions with citizen groups and/or government agencies. Some of the firms were still bitter about the delays or terminations, while others viewed the episodes as positive learning experiences. One petroleum environmental coordinator stated: "They caught us with our pants down and believe me, that will never happen again in

this company." Another U.S. chemical firm executive declared: "We needed that experience to shake up our project planners to the necessity of advance environmental planning."

Table VII.4 shows that nine of the surveyed firms had found it necessary to shut down existing facilities for environmental reasons. In four of the chemical MNCs, the forced closings were found to be quite numerous. Illustrative examples of such closings drawn from the literature include Gulf Oil's ordered shutdown of its ethylene cracker near Rotterdam;[23] Rio Tinto Zinc's closure of its lead and zinc smelter at Avonmouth;[24] American Metal Climax's phase out of its horizontal retort zinc smelter at Blackwell, Oklahoma;[25] Dow's closing of its chlorine-caustic plants in Canada and conversion from mercury cell to diaphragm cell technology;[26] and Dupont's closing of its Edgemoor, Delaware sulfate process titanium dioxide plant and replacement with chloride-process capacity.[27] Forced closings or major process conversions because of intractable environmental control problems appear to catalyze company-wide attention to issues of environmental protection. As one chemical company environmental director stated: "The closing of those plants appeared to trigger more top management attention to how we were handling environmental issues in the selection of process technology for our new plants."

Two-thirds of the MNCs, as shown in Table VII.4, had experienced a relatively high amount of adverse environmental publicity and/or protest activity during the five year period prior to planning the specific project examined in this study. Documented examples of such protest activity or adverse publicity include: the blockades by fishermen and protest marches in Tokyo against Chisso Corporation's Minamata plant because of mercury poisoning;[28] August Thyssen Hütte Company's widely publicized battle with angry Duisburg citizens over noise and dust from a new blast furnace;[29] the protesting pickets at the opening of Oxirane's propylene oxide plant near Rotterdam;[30] the voluminous national press coverage of Montedison's scarlino titanium dioxide waste dumping controversy;[31] the national cause célèbre initiated in the controversies over Union Carbide's ferroalloy plants in Ohio and West Virginia;[32] the criticism received by British Petroleum over the "Torrey Canyon" disaster of 1967;[33] and the highly publicized strike by workers against Shell Oil Co., which was supported by eleven U.S. environmental groups, over issues of environmental health and safety.[34]

The adverse publicity or protest activity was found to be directed at four kinds of issues: 1) pollution problems at existing, generally older, plants 2) lack of preventive environmental planning in connection with new proposed projects, 3) environmental disasters such as

tanker collisions, major oil spills, plant explosions, etc., and 4) problems of product environmental impact. Most of the firms interviewed appeared to negatively value such adverse publicity or protest. Some, however, appeared to be more accustomed to, or tolerant of, such adverse publicity than others. The environmental control directors in a few of the firms stated that one of their primary objectives was to keep their firms out of explosive environmental confrontations and out of the press of environmental issues. One U.S. director admitted that his performance was measured largely on the basis of this indicator.

The last indicator of conflict experience examined in this study was that of involvement in serious environmental litigation. A review of the litigation reported in such journals as the Environment Reporter, Journal of Planning and Environmental Law, and Environmental Law Reporter for the period 1970 through 1974 revealed that eight of the MNCs had been involved in a fair amount of serious environmental litigation (see Table VII.4). Examples of such litigation reported in the literature include: the $13.5 million in settlements made by Union Oil, Texaco, Gulf Oil, and Mobil in the Santa Barbara oil spill suits in compensation for damages caused by the January 28, 1969 blowout at Union's offshore oil well;[35] the suits brought against Dow Chemical and BASF Wyandotte for allegedly discharging mercury and mercury compounds into

Lake Erie, and the Detroit and St. Clair Rivers;[36] and the payment of $4.2 million to Japanese fishermen for loss of fish by Asahi Glass, Chiba VCM and Nihon Vinyl Chloride in Chiba, Japan.[37]

The law suits experienced by the firms in this study were initiated in connection with six different kinds of environmental issues: 1) air and water pollution from existing facilities, 2) inadequate or negligent environmental safety practices, such as failing to install safety valves on offshore wells, 3) serious spills of toxic chemicals in major water bodies, 4) environmental impacts of products such as herbicides, pesticides, and lead-free gas, 5) compensation for damages caused by explosions or accidents, and 6) procedural or substantive inadequacies in complying with the requirements of N.E.P.A. in the U.S., and in complying with public hearing requirements in Western Europe in conjunction with new projects.

A few of the firms had policies of staying out of court battles on environmental issues. One Canadian executive stated "environmental control is not a matter of fighting, but a matter of negotiating and compromising with the authorities to come up with reasonable standards . . . we abhor the legalistic approach to environmental protection . . . we are settlers, not fighters." One U.S. chemical firm environmental advisor expressed: "We avoid the courts as much as possible; with our sound technical position we

don't have to push as hard legally as other firms in our industry."

Instances of major environmental litigation were viewed in a few firms as the major catalysts which helped to institutionalize internal concern for matters of environmental protection. One petroleum conservation coordinator stated that his firm's extensive oil spill recovery and prevention program was put together only after the firm had experienced a major spill which resulted in major litigation and expensive settlements. "After that spill," said the executive, "top management really got on my back for an oil spill control program." In another case, where a company's president was sentenced to three months in jail (eventually suspended) for a major pollution incident, the firm's environmental control director stated: "What that judge did in fifteen days accomplished the change in top management orientation that I had been attempting to bring about for three years."

Brief mention should also be made of the variable of awards for environmental performance. Six of the firms in this study had received one or more U.S., British, or French awards. Examples include: 1) the Business Week "Business Citizenship Awards" for improving the physical environment, which in past years have been received by Owens Illinois, Dow Chemical, and American Metal Climax,[38] 2) "Environment Honor Awards" from The Environment Monthly

for making environmental excellence a basic condition in the pursuit of corporate goals (in 1974 awarded to Shell Oil Co., Dow Chemical, Reynolds Metals, American Cyanamid, among others),[39] and 3) the Sports Foundation's "National Gold Medal Awards" for outstanding achievement in the fight against water pollution, which for company-wide programs were received by Hercules in 1973 and Aluminum Company of America in 1972.[40] The influence of such positive reinforcements was not examined in this study.

This study has found environmentally-oriented project planning behavior to be fairly strongly directly associated with environmental conflict experience. Conflict has also been found to be closely related to various aspects of a firm's environmental management structure. Interpretation of these relationships must be cautious, however, as the index constructed above is highly imperfect for five reasons. First, the index is biased towards those firms operating in nations having legal-social-political structures oriented toward public participation, adversary procedures and judicial involvement, such as the United States and West Germany. It is of less use in gauging conflict in nations such as Canada and Sweden, which rely more on consensual administrative methods in the enforcement of environmental policy. Second, conflict may have beneficial or deleterious effects. In one firm observed in this study, extensive conflict had led only to defensiveness, and

malevolent feeling towards environmental groups. Third, sound environmentally-oriented planning was observed in a few firms scoring relatively low on the conflict index, perhaps indicating that conflict experience may not be a necessary precondition for such behavior. Fourth, the index aggregates conflict experience for the entire firm; as was evident, conflict experience varies widely for different divisions in, or different operating regions of, one firm. Finally, the influence of prior conflict may be a complex function of variations in the origin, form, intensity, and duration of such conflict; the above index dealt only simplistically with such subtleties.

Because of the weaknesses in the index mentioned above, caution is used in stating that prior conflictful experience appears to be positively associated with current ecological incorporation behavior. Project delays and terminations, forced plant closings, adverse publicity, and environmental litigation may serve to create well-perceived "performance gaps" or dissatisfaction within the firm. Such dissatisfaction may act as a prime stimulant in the search for, and adoption of, the innovation of ecological incorporation, by arousing an appropriate level of motivation. Conflict episodes, especially those that result in project delays or terminations, serve to emphasize the "relative advantage" of innovative ecological incorporation behavior.

In sum, necessity may indeed be the "mother of invention" in the case of this organizational innovation.

C. THE PUBLIC POLICY SYSTEM

1. Public Policy Variables in Combination

An intercorrelation matrix of the public policy variables is presented in Table VII.5. An examination of the table reveals a pattern of interrelationships among the five variables that is generally consistent with theoretical expectations. The character of the environmental policy in a MNC's home country is largely unassociated with the environmental policy in the country where it invested. This is true not only for the host country's generalized policy character but also for the more project-specific public examination and public pressure characteristics. Home country character was, however, found to be fairly strongly positively correlated with conflict experience. One would generally expect this to be so, because MNCs based in "leading" environmental policy nations are the ones which have been subjected to the earliest and most intense shifts in the governing norms and expectations.

Table VII.5 shows that the generalized character of a host nation's environmental policy is only mildly directly associated with the two project-specific applications of that policy. This partly implies that the substance and intensity of environmental policy measures as applied to a

TABLE VII.5

INTERCORRELATIONS AMONG PUBLIC POLICY VARIABLES[a)]

	Host Country Environmental Policy Character	Public Project Examination	Project-Associated Public Pressures	Environmental Conflict Experience
Home country environmental policy character	.0707	-.1157	.0000	.4043***
Host country environmental policy character		.2619	.3148	.1394
Public project examination			.6315*	.0936
Project-associated public pressures				.3483

[a)] Kendall Rank Correlation Coefficients (tau); significance levels: * = .01 level, ** = .05 level, *** = .10 level.

particular project may often differ from the substance and intensity of the nation's overall environmental policy. It perhaps also highlights the omission and aggregation problems connected with the generalized policy character index. Table VII.5 also reveals a very strong direct correlation between public project examination and project-associated public pressures. This indicates that public advocacy of environmental interests is probably greatly facilitated, and perhaps encouraged, by institutional arrangements designed to allow such advocacy. In other words, public expression is more likely when mechanisms for public scrutiny are available.

An examination of partial correlations among the public policy variables and ecological incorporation, presented in Table VII.6, provides additional insights into the nature of the system. The correlation between home country policy character and ecological incorporation is substantially reduced when the extent of conflict experience is held constant. This finding is consistent with the idea advanced above that firms based in "leading" environmental policy nations will tend to experience greater external conflict over environmental issues, which in turn probably leads to more innovative ecological incorporation behavior. In a similar fashion, the association between host country environmental policy character and ecological incorporation appears to be mediated by both public project examination

TABLE VII.6

PUBLIC POLICY PARTIAL CORRELATION ANALYSIS[a)]

Variable	Zero-Order Correl. w/ Ecol. Incorp.	Partial Correlation with Ecological Incorporation Controlled for:				
		Home Country Environmental Policy	Host Country Environmental Policy	Public Project Examination	Project-Associated Public Pressures	Environmental Conflict Experience
Home country environmental policy character	.1330	--	.0838	.2538	.3078	-.1740
Host country environmental policy character	.3122	.2961	--	.1004	.1197	.3156
Public project examination	.4602	.4992	.3680	--	.2383	.4922
Project associated public pressures	.7879	.8066	.7654	.7391	--	.7381
Environmental conflict experience	.6036	.6103	.6049	.6237	.4868	--

a) Pearson product-moment zero-order and first-order partial correlation coefficients.

and project-associated public pressures. The greater the governmental intervention in, public attention to, political salience of, and duration of concern about, issues of environmental protection in the host nation, the more fully developed the arrangements for public examination will probably be, and the more likely it will be that public pressures will arise in the context of a new project. Public examination and pressure will in turn generally lead to greater ecological incorporation.

Table VII.6 also reveals that the association between public examination and ecological incorporation is moderately reduced when the extent of public pressure is held constant. Either pressure is partly an intervening variable between examination and ecological incorporation, or the correlation between examination and incorporation is partly spurious, being a joint effect caused by the variation in pressure. It appears that the former is probably the case. Greater opportunity for public examination (e.g., hearings, reviewing impact statements) probably enables citizens and citizen groups to exert more pressure, which in turn appears to result in more environmentally-oriented project planning behavior. Extensive arrangements for public project examination will tend to reduce the barriers to participation and will tend to increase the amount of project information available for scrutiny. Participation and information represent the "raw materials" required for

effective advocacy of environmental interests and thus are probably partial facilitators of public pressure.

The relationships between project associated public pressures and ecological incorporation, and between environmental conflict experience and ecological incorporation remain strong no matter what control policy variable is introduced. This would lead one to believe that both of these policy variables are related to incorporation behavior independently of other public policy system variables.

In short, examination of the public policy variables in combination has revealed that the extent of public pressure is strongly and independently related to ecological incorporation. Environmental conflict experience is also independently related, but not quite as strongly as public pressure. The extent of public project examination appears to be moderately related, but the association appears to be partly mediated by public pressure. Finally, home and host country environmental policy character, partly because of aggregation and omission problems in index construction, but also because the influences from these generalized "setting" variables may be largely irrelevant for what a firm is required to do in a specific project planning situation, were found to be unrelated in a direct fashion to ecological incorporation.

2. Public Policy Variables in Relation to Project Nature and Organization

Table VII.7 provides a matrix of intercorrelations between the five public policy variables and the variables contained in the project nature and organizational systems. Because many of the interrelationships between the public policy system and the project nature and internal organization systems have been examined in Chapters V and VI respectively, attention here can be relatively brief.

Public project examination is strongly correlated with both project cost and length of the planning period. In a similar fashion, project-associated public pressure is strongly associated with both of these variables and also with project type. High cost, "high" environmental impact type projects thus usually require a longer planning period, are normally subjected to greater public scrutiny, and typically induce more intense public pressures. It is interesting to note that the MNCs undertaking "high" environmental impact type projects are typically the ones which have experienced the greatest amount of conflict over environmental issues in the past.

MNCs based in nations where the character of environmental policy has been progressive are generally the ones possessing the greatest commitment to objectives of environmentally responsible behavior and engaging in the most external surveillance with regard to environmental

TABLE VII.7

INTERCORRELATIONS OF PUBLIC POLICY VARIABLES WITH PROJECT NATURE AND ORGANIZATIONAL VARIABLES[a)]

	Home Country Environmental Policy Character	Host Country Environmental Policy Character	Public Project Examination	Project-Associated Public Pressures	Environmental Conflict Experience
Project Nature System:					
Project type	.2603	.3313	.2530	.4373**	.5091**
Project cost	.0460	.1366	.5111**	.6044	.2825
Project year	.0377	-.0959	.0814	.0974	.1143
Site location type	.2015	-.2621	.0870	.1273	.1833
Project ownership	-.3831	.4454**	-.1314	.0000	-.1807
Planning period length	.0393	.3444	.7153*	.4625**	.0596
Organizational System:					
EC objectives and top management commitment	.6758*	.0000	.0569	.1270	.3018
EC role assignment	.2485	-.1897	-.1265	-.0107	.2373
EC performance measurement	.2095	-.4556**	-.1818	-.1579	.2025
EC research & technology programs	.0680	-.3811***	.0882	-.0821	.0124
EC external surveillance & interaction	.4472***	.0738	-.0805	.1605	.4068***
Company profitability	.3967***	-.2178	-.2161	-.1010	.1168
Company size	.1634	-.2970	-.0432	.1508	.3291
Company investment intensiveness	.4668**	-.0594	-.2161	-.0302	.3715***

[a)] Kendall Rank Correlation Coefficients (tau); significance levels: * = .01 level, ** = .05 level, *** = .10 level.

issues. They also tend to be relatively most profitable and investment intensive. We saw above that firms based in such "leading" policy nations had also typically experienced the greatest amount of external conflict. Table VII.7 shows that firms with a past record of external conflict tend to be engaging in more current external surveillance and new investment activity.

In order to further clarify the interactions among the three systems, a partial correlation analysis was performed and appears in Table VII.8. The three variables of public examination, public pressures, and conflict experience maintain at least moderately strong associations with ecological incorporation in spite of what single, or group of, control variables from the other two systems are introduced. The moderate reduction in the correlation between conflict and incorporation when a firm's environmental management structure (i.e., objectives, role assignment, and external surveillance) is held constant, however, does suggest that the relationship is partly mediated by such organizational variables. That is, conflict experience appears to influence a firm to adjust its organizational structure in environmental management terms, which in turn tends to result in greater ecological incorporation in the planning process.

The correlation between home country policy character and incorporation is dramatically reduced when the firm's

TABLE VII.8

PUBLIC POLICY WITH ECOLOGICAL INCORPORATION PARTIALED ON PROJECT NATURE AND ORGANIZATION[a)]

	Zero-Order Correl. w/ Ecol. Incorp.	First-order and Third-order Partial Correlations with Ecological Incorporation Controlled for:				
		Project Type	Project Type, Project Cost and Site Location Type	Company Size	Company Investment Inclusiveness	EC Objectives, EC Role Assignment, EC External Surveillance
Home country environmental policy character	.1330	-.0544	.1445	.1159	-.1604	-.6528
Host country environmental policy character	.3122	-.0898	.0461	.4501	.4943	.3794
Public project examination	.4602	.3618	.3647	.5502	.8193	.7450
Project associated public pressures	.7879	.6692	.7428	.7341	.8375	.8832
Environmental conflict experience	.6036	.3533	.3529	.4600	.5216	.4483

a) Pearson product-moment zero-order, first-order, and third-order partial correlation coefficients.

environmental management structure is held constant. This finding tends to confirm the idea advanced above that exposure to the progressive environmental policy will generally cause a firm to more fully adjust its organizational structure for environmental management ends, which in turn, will tend to either motivate or facilitate environmentally-oriented project planning behavior. The reductions in the correlation coefficient between host country policy character and incorporation when project nature controls are introduced probably reveals a spurious relationship. In other words, the mild correlation between host country policy character and ecological incorporation appears to result solely from the joint effects of project nature on both of these variables, and hence may be derived from spurious causes.

Our examination above, as well as in Chapters V and VI, of the interrelationships between the public policy system and the other two influence systems leads one to the following conclusions. The observed strong associations of the project nature variables of project type and project cost with ecological incorporation are partly mediated by the policy variables of public examination and public pressure. In other words, high impact, high cost projects typically result in greater public pressure and examination, which in turn, appear to partly necessitate greater

ecological incorporation in the planning process. Rather than acting as intervening variables, the two variables of home country environmental policy character and environmental conflict experience appear to be acting as antecedent driving forces in the case of many of the organizational variables. MNCs exposed to the pressures exerted in nations further along in the environmental protection "issue-attention" cycle have generally more fully adjusted their organizational structure, especially objectives, external surveillance, and role assignment, in order to bring about environmentally sound behavior.

D. SUMMARY ON THE INFLUENCE OF PUBLIC POLICY

Much of the motivation for environmentally-oriented project planning behavior appears to be either directly or indirectly derived from variables in the public policy influence system. In direct terms, public project examination and project-associated public pressures appear to be primary stimulants of such behavior. In indirect terms, the organization variables of EC objectives and EC external surveillance are strongly related with such behavior largely because of antecedent influence from progressive home nation environmental policy and prior environmental conflict experience. In a similar fashion, the project nature variables of project type and project cost are strongly related with ecological incorporation largely because more intense public

pressures and more extensive public examination are usually forthcoming for such large scale, high cost, high impact projects.

Pressures for environmental protection from governmental, citizen group, community, and media organizations appear to strongly and independently induce ecological incorporation behavior. Project planners devote more energy to environmental issues in anticipation of the expected pressures which will arise after the project is announced, and also at a late stage of the planning process in reaction to actual "felt" pressures and demands. More time and effort is also devoted to issues of environmental impact during project planning when the firm knows that it will be required to disclose the basis of its environmental judgments and plans in a public forum. Formal mechanisms of public scrutiny such as public hearings, advance impact statements, planning permissions, discharge permits, and so forth appear to especially induce anticipatory environmental planning efforts. Institutional arrangements for ensuring a "public interest perspective" in the course of industrial development thus appear to be stimulative of ecological incorporation.

Conflict experience appears to stimulate the search for, and adoption of, the ecological incorporation innovation. Such conflict creates perceived "performance gaps," catalyzes top management attention to environmental issues,

and emphasizes the "relative advantage" of innovative environmentally-oriented decision-making and planning practices.

The generalized character of both home country and host country environmental policy does not appear to be strongly and directly related to ecological incorporation. Planning behavior in a specific project-location situation may only be loosely related to the generalized intensity of pressures for environmental protection exerted from the national settings. It is clear, however, that MNC planning behavior for projects abroad does not exactly mirror the level of pressures previously experienced in the home country. It also does not adjust down completely to the level of pressure exerted currently in the host country. In short, planning typically reflects a behavioral pattern falling somewhere in between what one would expect from the firm in its home country and what one would expect from an indigenous firm in the host country. As was pointed out in the chapter, however, the index of environmental policy character constructed in this study represents only a crude first attempt at comparative environmental policy impact evaluation; the problems of aggregation and omission await further research.

FOOTNOTES

CHAPTER VII

[1]See: Stuart S. Nagel, "Incentives for Compliance with Environmental Law," American Behavioral Scientist, 17 (May-June, 1974), pp. 690-710.

[2]One metals MNC confronted with an imposing list of environmental conditions from a local county council simply ignored some of them which it considered to be too burdensome. The firm had determined that the council would never have the skilled manpower to effectively enforce the conditions.

[3]In the Netherlands many firms have been operating for years without permits as required by the Nuisance Act. In Sweden the firms prefer to apply for permit exemptions rather than permits. This allows them to settle the control issue in "negotiations" between the National Environment Protection Board rather than going through the more elaborate court-like permit procedure involving public hearings and stringent rules for public notice and participation. See: Lennart J. Lundquist, "Do Political Structures Matter in Environmental Politics?" American Behavioral Scientist, 17 (May-June, 1974), p. 742.

[4]A few executives suggested that France's Ministry for Protection of Nature and the Environment, for example, was created more for public image purposes than for real action.

[5]According to various executives, the agencies in Canada and Australia have particularly suffered from these problems.

[6]The fact that a nation has environmental regulations does not necessarily mean that they are rigorous. Mexico's air pollution regulations only apply to solid particulate matter, not gases. The standards correspond, in the case of existing plants, to a maximum four times as high as the ones specified for the city of St. Louis, Missouri. See: Corrado V. Schaepfer, "Environmental Control in Mexico," Mexican-American Review, 40 (Feb., 1972), p. 17.

[7]France and Sweden, for example, have offered generous incentives for anti-pollution investment. For a review of government tax aids in Europe see: "Governments Offer Tax Aids for Pollution-Control Outlays," Business Europe (Jan. 14, 1972), pp. 12-13.

[8]For a discussion of regulatory failure as it relates to project siting see: Barry M. Mitnick and Charles Weiss, Jr., "The Siting Impasse and a Rational Choice Model of Regulatory Behavior: An Agency for Power Plant Siting," Journal of Environmental Economics and Management, 1 (Aug., 1974), pp. 150-171.

[9]Ibid., p. 151.

[10]Statement by Alfred Guido, Chief of Environmental Review for New Jersey's Department of Environmental Protection in: "Impact Statement Makes Impact," Chemical Week (Nov. 13, 1974), p. 40.

[11]For one review of these inadequacies see: Thomas G. Dickert and Jens C. Sorensen, "Some Suggestions on the Content and Organization of Environmental Impact Statements," in Thomas G. Dickert with Katherine R. Domeny, eds., Environmental Impact Assessment: Guidelines and Commentary (Berkeley: University Extension, University of California, 1974), pp. 35-53.

[12]"How Social Responsibility Became Institutionalized," Business Week (June 30, 1973), p. 78.

[13]See: Nicholas Faith, The Infiltrators: The European Business Invasion of America (New York: E.P. Dutton, 1972), Chapter 11, "BASF--The Environment Hits Back."

[14]For one report of the dispute see: Alan Ternes, "An Introduction to the Setting and Characters of the Tragical Farce or Farcical Tragedy of Victoria Bluffs, S. C.," Natural History, 79 (April, 1970), pp. 8ff.

[15]Walter J. Hickel, Who Owns America? (New York: Paperback Library, 1972), p. 102.

[16]"Where Pollution Control is Slowing Industrial Growth," U.S. News and World Report (Aug. 23, 1971), p. 49.

[17]"A Statement of Fact by Shell Oil Company," The Wilmington Morning News (Aug. 23, 1972), p. 19.

[18]Mr. Abrams, "Thinking Out Loud: Peterson Misstates Facts About Shell," The Wilmington Evening Journal (May 14, 1974), p. 23.

[19]"Exxon: Testing the International Tiger," Time (Feb. 18, 1974), p. 29.

[20]See: "Alaska: Closer to Cashing Oil's Riches," Business Week (March 25, 1972), pp. 78-83; Bryan Sage, "Pipelines Across Alaska," New Scientist, 62 (April 4, 1974), pp. 10-12; and Richard Corrigan, "Alaska Embarks on Its Biggest Boom as Oil Pipeline Gets Underway," Smithsonian, 5 (Oct., 1974), pp. 38-49.

[21]See: "Europe Antes Up for Chemicals," Chemical Week (May 22, 1974), p. 46.

[22]See: "Dutch Demonstrators Put Pressure on Polluters," Chemical Week (Aug. 23, 1972), p. 35.

[23]See: "The Antipollution War Intensifies; Higher Costs Jeopardize Plans," Business Europe (Sept. 3, 1971), p. 288.

[24]See: "Showpiece Smelter Bites the Dust," Chemical Week (March 1, 1972), p. 43.

[25]See: "A Community Already Bitter Over a Pollution Suit Learns the Smelter That Pollutes is Closing Down," Wall Street Journal (May 18, 1972), p. 38.

[26]See: "Dow Chemical Sets Closing of Canada Plant Due to Mercury Woes," Wall Street Journal (April 5, 1973), p. 28.

[27]See: "Pigment Bind Will Not End Soon," Chemical Week (Aug. 14, 1974), p. 29.

[28]See: "Japan's Fishermen Force Chlorine Makers to Switch," Chemical Week (Aug. 1, 1973), pp. 31-32.

[29]See: "The Black Giant," Newsweek (May 7, 1973), p. 87.

[30]See: "Dutch Demonstrators Put Pressure on Polluters," Chemical Week (Aug. 23, 1972), p. 35.

[31]See: "Montedison TiO_2 Plant Faces Closure," European Chemical News (Feb. 23, 1973), p. 6.

[32]See: "A Corporate Polluter Learns the Hard Way," Business Week (Feb. 6, 1971), pp. 52-56.

[33]See: Noël Mostert, "Profiles: Supertankers-I," The New Yorker, 50 (May 13, 1974), pp. 45-100 and Noël Mostert, "Profiles: Supertankers-II," The New Yorker, 50 (May 20, 1974), pp. 46-99.

[34]See: "New Allies Among Environmentalists," Business Week (Feb. 24, 1973), p. 86, and "Strike at Shell Oil Refineries Gets Support of Environmental Groups," Environment Reporter, 3 (Feb. 9, 1973), p. 1233.

[35]See: "Oil Spill Trial," Environment Reporter, 2 (May 14, 1971), p. 41; "$4.5 Million Oil Spill Settlement," Environment Reporter, 2 (Dec. 3, 1971), p. 914; and "Oil Companies Agree to Pay $9 Million to Settle Santa Barbara Oil Spill Suit," Environment Reporter, 5 (July 26, 1974), p. 400.

[36]See: "Ohio Water Pollution Laid to Dow Chemical and BASF Wyandotte," Wall Street Journal (March 23, 1972), p. 11; "Dow Chemical Sued," Environment Reporter, 1 (March 19, 1971), p. 1259; "Dow of Canada's Defense," Environment Reporter, 1 (April 2, 1971), p. 1324; and "Ohio Mercury Suit," Environment Reporter, 2 (March 31, 1972), p. 1454.

[37]See: "Japanese Chlorine Makers are Paying Million to Fishermen," Chemical Week (Aug. 22, 1973), p. 47.

[38]For the 1973 awards see: "How Social Responsibility Became Institutionalized," Business Week (June 30, 1973), pp. 74-82.

[39]For the full list of 1974 Environment Honor Awards Citations see: The Environment Monthly (April, 1974), p. 2.

[40]For full reviews on the 1973 grand award winners and finalists see: The Sports Foundation, National Gold Medal Awards: For Outstanding Achievement in the Fight Against Water Pollution (Chicago: The Sports Foundation, Inc., 1973).

CHAPTER VIII

CONCLUSIONS ON THE DETERMINANTS OF ECOLOGICAL INCORPORATION: A TENTATIVE MODEL

A. INTRODUCTION

The objectives of this research have been to: 1) describe the extent to which, and the manner in which, ecological considerations have been incorporated into multinational corporate project planning, and 2) to identify in an exploratory manner the variables which appear to explain the extent and manner of this incorporation. The material in Chapter IV through VII can now be integrated, summarized, and interpreted in the framework of two questions: 1) to what extent and why, and 2) in what manner and why have environmental factors been integrated into project planning by MNCs?

For a number of interrelated reasons, the conclusions offered below can be only highly tentative. Considerable caution is necessary given: 1) the small size of the sample, which ruled out randomization, 2) the cross-sectional nature of the study, which took observations only at a single point in time, 3) the possibility that some relevant variables, or "confounding influences," have been

omitted or overlooked in the study, 4) the necessary use of arbitrary cutpoints and crude categorization, which entailed a certain loss of information, 5) the dependence on correlational information and assumptions of both linear relationships and additive effects of the independent variables, 6) the finding of multicollinearity (i.e., many of the independent variables were highly correlated), which created difficulties in assessing the relative influence of the variables, and 7) the possible existence of measurement and sampling error.

Despite this "formidable" list of limitations, however, various conclusions or inferences can be drawn from the study, and a tentative explanatory model can be formulated. There is nothing absolute about the model presented below. It represents only the "best" interpretation which the researcher believes can be given to the findings in light of both its strengths and limitations. The model is advanced cautiously, in the spirit of exploratory research, because the present data cannot provide a direct demonstration that this interpretation is more than plausible. It is hoped that the adequacy of the model will be subjected to further testing, refinement, and extension in future research.

B. TO WHAT EXTENT AND WHY?

1. To What Extent?

To what extent is the mode of project planning currently utilized by MNCs environmentally-oriented? Stated more precisely, to what extent are inputs and means related to concerns of ecology present and employed in the planning processes? The following conclusions can be offered from the description and measurement of "ecological incorporation" in MNC project planning as presented in Chapter IV.

There is currently a broad range of behavior among MNCs. At one end of this range are some firms which appear to be sensitively and comprehensively taking environmental considerations and values into account. At the other end are many more which appear to be indifferent to environmental concerns, and in their planning are considering little beyond the immediate economic and technical aspects of their projects. The bulk of observed MNC behavior falls in between these polar extremes, but is "bunched" towards this latter "low incorporation" pole and can best be described as "unecological."

Some MNCs are conducting one million dollar extensive pre-project environmental impact studies, while others are not even spending $30,000 for limited baseline surveys of site environmental conditions. Some are placing full-time environmental professionals on their project planning teams, while others still utilize only engineering and

economic personnel. Some begin programs of environmental research at an early stage of planning, while others engage in only last-minute "window-dressing" studies. Some have attempted to make their planning "participatory" by seeking community and conservation group advice throughout the course of planning; others plan in a secret and exclusionist manner, announcing the project to the community only a few weeks before the public hearing. Some consider the potential impacts of a broad range of project-related actions such as construction, transportation, residuals, and so on, while others barely consider residuals alone. In some firms projects are separately reviewed for environmental impacts by top management committees, while in others the director of environmental affairs never even sees the project plans. In sum, this study, by means of calculated composite scores of "ecological incorporation" (summated scores of each project across twenty-six indicators), has discovered a great deal of incorporation in some MNC planning processes and very little in others. What explains this variation?

2. Why, To What Extent?

a. Hypothesized model

In the conceptual framework of this study, as constructed in Chapter II, a model of contextual explanation was proposed. It was posited that the extent of "ecological incorporation" embodied in a MNC project planning process

would be closely related to the "contextual setting" in which the process was carried out. Furthermore, it was suggested that variation in the extent of incorporation could be explained by variation in contextual influences. This initially proposed explanatory model is shown diagrammatically in Figure VIII.1.

As shown in this figure, ecological incorporation was hypothesized to be a function of the combined influence of variables in three interlocking systems--the project nature system, the organizational system, and the public policy system. Multiple transmission channels of inward influence, both direct and indirect, were conceptualized, as represented by the six arrows in the figure. The model was consolidated into an overall summary proposition as follows:

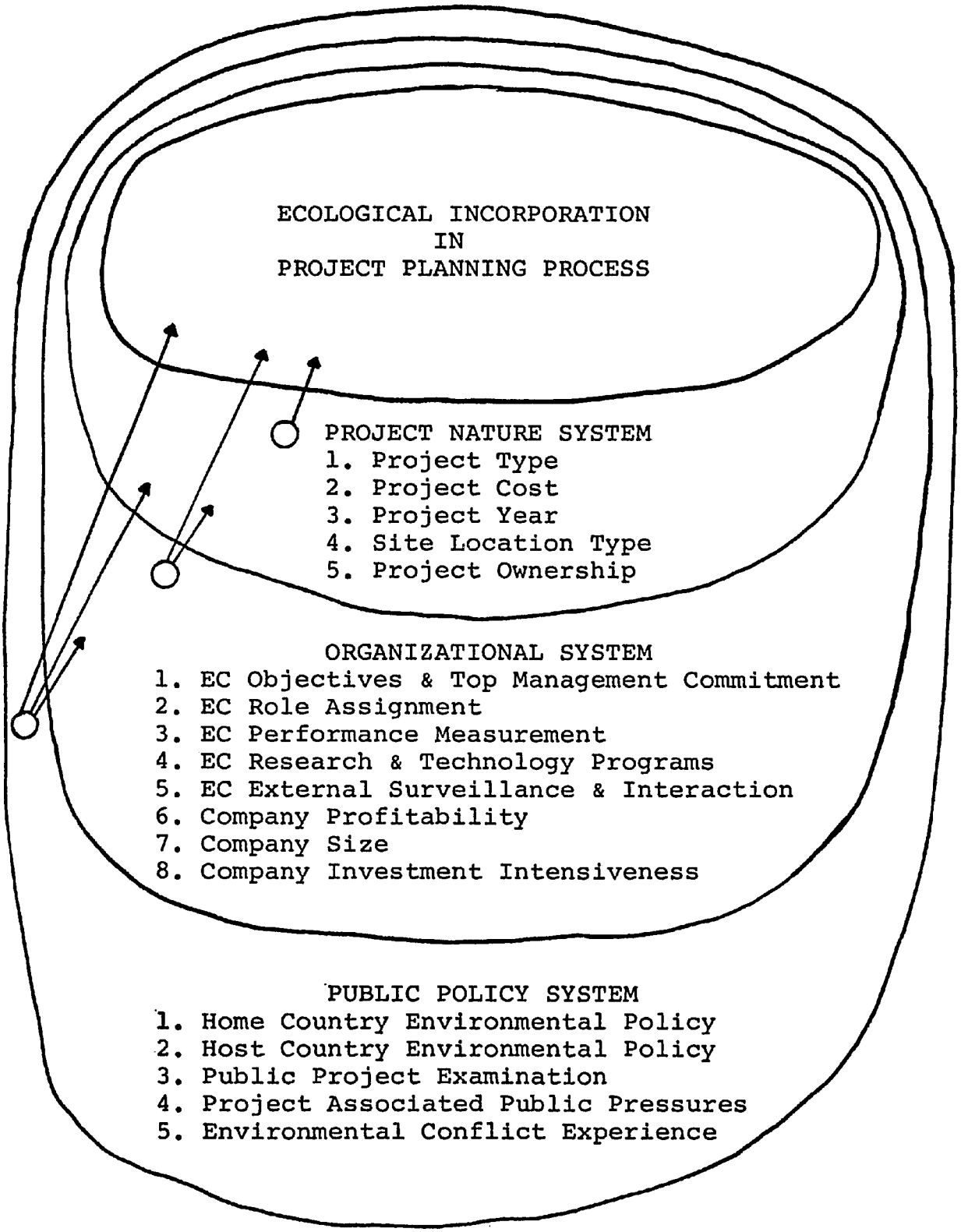
> The extent of "ecological incorporation" embodied in a given multinational corporate project planning process is a function of an interaction among: 1) the nature of the project, 2) the organizational context of the project planning process, and 3) the public policy context of the firm and the given project being planned.

b. Confirmation of summary hypothesis

The data of this study support the above stated summary proposition, although, as operationalized, the relationships were weak in some cases. This confirmation decision is derived from two basic findings: 1) at least two variables contained within each of the three systems

FIGURE VIII.1

CONCEPTUAL FRAMEWORK OF CONTEXTUAL EXPLANATION



appear to possess at least some independent explanatory power, and 2) a considerable amount of interaction among variables from the three systems was discovered. This latter result appears extremely important in explaining ecological incorporation behavior. These findings were achieved primarily by means of correlational analysis, which was not able to demonstrate causality, but only degrees of of relationship. It did, however, permit the making of inferences concerning the adequacy of the proposed explanatory model.[1] To help guard against the danger of reaching erroneous and misleading conclusions, all discovered relationships were "fully controlled" for relevant variables which were possibly either antecedent or intervening. Confidence in the genuineness and independence of the discovered associations was greatly increased through extensive use of this "partialling out" process.[2]

c. Individual influence of systems and associated variables

Table VIII.1 provides a summary of the correlations attained between the dependent variable of ecological incorporation and the eighteen independent variables included in the study. Three kinds of correlational information are provided for each variable. Column one contains the zero-order rank correlation coefficients most appropriate for the ordinal nature of the data. For purposes of comparison, column two provides product moment correlation coefficients,

TABLE VIII.1

SUMMARY OF CORRELATIONS WITH ECOLOGICAL INCORPORATION[a)]

Variable	Zero-order[b)] Rank Correlation with Ecological Incorporation	Zero-order[c)] Product Moment Correlation w/ Ecological Incorporation	Lowest[d)] First-order Partial Correlation w/ Ecological Incorporation	Occurring When Controlled for:
Project Nature System				
Project Type	.5820*	.6692*	.5642**	(Project Cost)
Project Cost	.6952*	.5993**	.4961***	(Public Pressures)
Project Year	-.1040	-.1004	-.2303	(Public Pressures)
Site Location Type	.3892***	.3963	.1551	(Project Cost)
Project Ownership	-.0587	.0859	-.0016	(Project Cost)
Organizational System				
EC Objectives & Top Management Commitment	.5087**	.6150**	.3463	(EC External Surveillance)
EC Role Assignment	.3086	.4351	-.0509	(EC External Surveillance)
EC Performance Measurement	.1627	.3547	-.1108	(EC Objectives)
EC Research & Technology Programs	.1014	.1523	-.0644	(EC Objectives)
EC External Surveillance and Interaction	.4938**	.6076**	.3273	(EC Objectives)
Company Profitability	.1933	.1980	-.5118	(Investment Intensiveness)
Company Size	.2706	.4999***	.2638	(Conflict Experience)
Company Investment Intensiveness	.4252**	.5529**	.0366	(EC External Surveillance)

continued--

TABLE VIII.1--continued

Variable	Zero-order[b] Rank Correlation with Ecological Incorporation	Zero-order[c] Product Moment Correlation w/ Ecological Incorporation	Lowest[d] First-order Partial Correlation w/ Ecological Incorporation	Occurring When Controlled for:
Public Policy System				
Home Country Environmental Policy Character	.2530	.1330	-.3950	(EC Objectives)
Host Country Environmental Policy Character	.1561	.3122	.1004	(Public Examination)
Public Project Examination	.4046***	.4602***	.2383	(Public Pressures)
Project Associated Public Pressures	.5648*	.7879*	.7391*	(Public Examination)
Environmental Conflict Experience	.4080***	.6036**	.4369	(EC External Surveillance)

[a] Significance levels: * = .01 level, ** = .05 level, *** = .10 level.

[b] Kendall Rank Correlation Coefficients (tau).

[c] Pearson Product Moment Correlation Coefficients.

[d] Pearson Product Moment First-Order Partial Correlation Coefficients.

which assume interval scales. The coefficients obtained are for the most part not very different from the ones calculated by the rank order procedure. Column three provides first-order partial correlation information. The coefficients presented here represent the lowest partial correlations obtained for each of the variables as a result of introducing a number of possibly relevant controls. The particular control variable on which each of the lowest partials was discovered appears in parentheses to the left of the coefficient. This partial correlation coefficient is a crude indicator of each variable's independent explanatory power, because it represents the lowest point to which the correlation dropped during the course of introducing a dozen control factors, one at a time.

1) Project nature system.--Two variables within the project nature system were found to be strongly and independently related to ecological incorporation. One was the type of project, as measured by the relative severity and range of associated potential adverse environmental impacts. The other was the total cost of the project. Either of these represents a fairly good predictor of the extent of incorporation. The extent to which the site location was nonindustrial in character was also discovered to be positively associated, but only weakly, since the zero-order correlation is partially spurious due to the

joint effect caused by variation in project cost. The extent of project ownership and the year in which the planning activity was most intensive were both found to be unrelated to incorporation.

2) Organization system.--The organizational system was discovered, through means of data analysis, to consist of two distinct but interrelated subsystems. The first could be described as the firm's "environmental management structure" and includes objectives, external surveillance, role assignment, research and technology, and performance measurement. The second was found to consist of size, profitability, and investment intensiveness, and could be described as the firm's "economic character."

Within the "environmental management structure" subsystem two variables were found to be independently, but only moderately positively, related to the extent of ecological incorporation. One was the firm's objectives and top management support for environmentally responsible behavior. The other was the extent of external scanning and interorganizational relations in the area of environmental protection. Environmentally-sound project planning can be moderately predicted by either of these two. The other structural variables of role assignment, performance measurement, and relevant R & D in the area of environmental control were found to be only weakly associated with the

dependent variable. When the correlations of these three variables with ecological incorporation were controlled for either objectives or external surveillance, the positive correlations vanished completely.

The three variables in the "economic character" subsystem all appear to be important in the explanation of ecological incorporation, but primarily in only indirect ways. The relationship between profitability and incorporation appears genuine, but weak, and is mediated by a number of intervening variables such as investment intensiveness, objectives, and surveillance. Investment intensiveness is moderately related, but chiefly exerts it influence by affecting variables in the firm's "environmental management structure." Corporate size possesses some moderate, independent explanatory power, but also exerts its prime influence in an indirect fashion by affecting other organizational variables, which in turn are more directly related to ecological incorporation.

3) Public policy system.--The public policy system, as the organizational system, is also composed of two subsystems. One could be labeled the "home country--past experience system" and the other as the "host country--current demands system." Unlike the two organizational subsystems which are highly interrelated, these two policy subsystems appear to be totally independent from one another.

The variable emerging as by far the most powerful predictor of ecological incorporation was found in the "host country" public policy subsystem and is project-related public pressures. The relationship remained very strong no matter what control variable was introduced. Institutional arrangements for public examination of the project also appear to be independently and positively related to incorporation behavior, but in a much weaker fashion. Host country environmental policy, as operationalized in a generalized fashion in this study, appears to be only weakly directly associated. Partial correlation analysis shows, however, that it plays a formative role in the determination of both project-related public pressure and public project examination.

In a direct fashion, home country environmental policy is unrelated to how a firm goes about planning a project for a foreign host nation. It appears to play an important indirect role, however, in that it represents a key determinant of whether the firm has experienced conflict over environmental issues and has adapted its objectives and external surveillance in the direction of environmentally-responsible behavior. A MNC's past history of conflict with external bodies over environmental issues is moderately and positively associated with its current planning behavior. It appears to exert both a direct influence on the planning process and an indirect influence

in affecting the firm's overall environmental management structure.

4) Summary: individual research hypotheses.-- Exhibit VII.1 provides a summary of this researcher's judgments on the confirmation of the study's hypotheses. Four kinds of inference information are provided for each of the eighteen hypotheses. The first column identifies whether the hypothesis has been confirmed by the findings. These confirmations are not based entirely on strict statistical testing, but should be interpreted as softer judgments reached through a mixture of quantitative and qualitative considerations. Where the hypothesis was confirmed, additional inferences on the apparent nature (direct or indirect) and strength of each variable are provided in columns two and three. Column four identifies whether the rank correlation of each variable with ecological incorporation was found to be statistically significant.

d. The variables and systems in combination

The extent of ecological incorporation embodied in a MNC project planning process appears to be related to a complex web of factors. We have been able, however, to achieve a tentative understanding of the direct and indirect linkages involved by using partialling. Spurious relationships were identified, intervening variables were located, and confidence in the independence of certain variables was

EXHIBIT VIII.1

SUMMARY: CONFIRMATION OF HYPOTHESES

The Ecological Incorporation Embodied in the Project Planning Process Will be Greater . .	Hypothesis Confirmed?		Apparent Nature of Effect		Apparent Strength of Effect			Statistically Significant at the .10 Level?	
	Yes	No	Primarily Direct	Primarily Indirect	Strong	Moderate	Mild	Yes	No
1. the greater the relative severity and range of potential adverse environmental impacts associated with the type of project.	X		X		X			X	
2. the greater the total cost of the project.	X		X		X			X	
3. the later the year in which project planning activity was most intensive.		X							
4. the greater the extent to which the site location of the project is currently nonindustrial in character.	X		X				X	X	
5. the greater the extent of ownership of the project by the firm doing the planning.		X							

continued--

EXHIBIT VIII.1--continued

The Ecological Incorporation Embodied in the Project Planning Process Will be Greater . .	Hypothesis Confirmed?		Apparent Nature of Effect		Apparent Strength of Effect			Statistically Significant at the .10 Level?	
	Yes	No	Primarily Direct	Primarily Indirect	Strong	Moderate	Mild	Yes	No
6. the greater the extent to which the corporation's objectives for environmentally responsible behavior are made formally explicit, expressed in leadership terms, applied globally, and backed by frequent illustrations of top management support.	X		X			X		X	
7. the greater the extent to which the corporation has assigned personnel to formal roles concerned with environmental control.		X							
8. the greater the extent to which corporate plant and managerial environmental control performance is measured and evaluated.		X							
9. the greater the extent to which the corporation has researched, developed, and commercialized environmental control technology and know-how relevant to the project		X							

continued--

EXHIBIT VIII.1--continued

The Ecological Incorporation Embodied in the Project Planning Process Will be Greater . .	Hypothesis Confirmed?		Apparent Nature of Effect		Apparent Strength of Effect			Statistically Significant at the .10 level?	
	Yes	No	Primarily Direct	Primarily Indirect	Strong	Moderate	Mild	Yes	No
10. the greater the extent of external surveillance of, interaction with, and internal dissemination of information about, the actions and plans of governmental environmental agencies, industry environmental organizations, and citizen environmental groups by the corporation.	X		X			X		X	
11. the greater the relative profitability of the corporation.	X			X			X		X
12. the larger the size of the corporation.	X			X			X		X
13. the larger the relative size of the corporation's current capital expenditure program (investment intensiveness).	X			X		X		X	

continued--

EXHIBIT VIII.1--continued

The Ecological Incorporation Embodied in the Project Planning Process Will be Greater . .	Hypothesis Confirmed? Yes	Hypothesis Confirmed? No	Apparent Nature of Effect: Primarily Direct	Apparent Nature of Effect: Primarily Indirect	Apparent Strength of Effect: Strong	Apparent Strength of Effect: Moderate	Apparent Strength of Effect: Mild	Statistically Significant at the .10 Level? Yes	Statistically Significant at the .10 Level? No
14. the more comprehensive the governmental administrative machinery for dealing with issues of environmental protection, the greater the public, interest group, and media attention to these issues, and the earlier the timing of governmental action and public a attention in the home country of the corporation (environmental policy).		X							
15. the more comprehensive the governmental administrative machinery for dealing with issues of environmental protection, the greater the public, interest group, and media attention to these issues, and the earlier the timing of governmental action and public attention in the host country of the corporation (environmental policy).		X							

continued--

EXHIBIT VII.1--continued

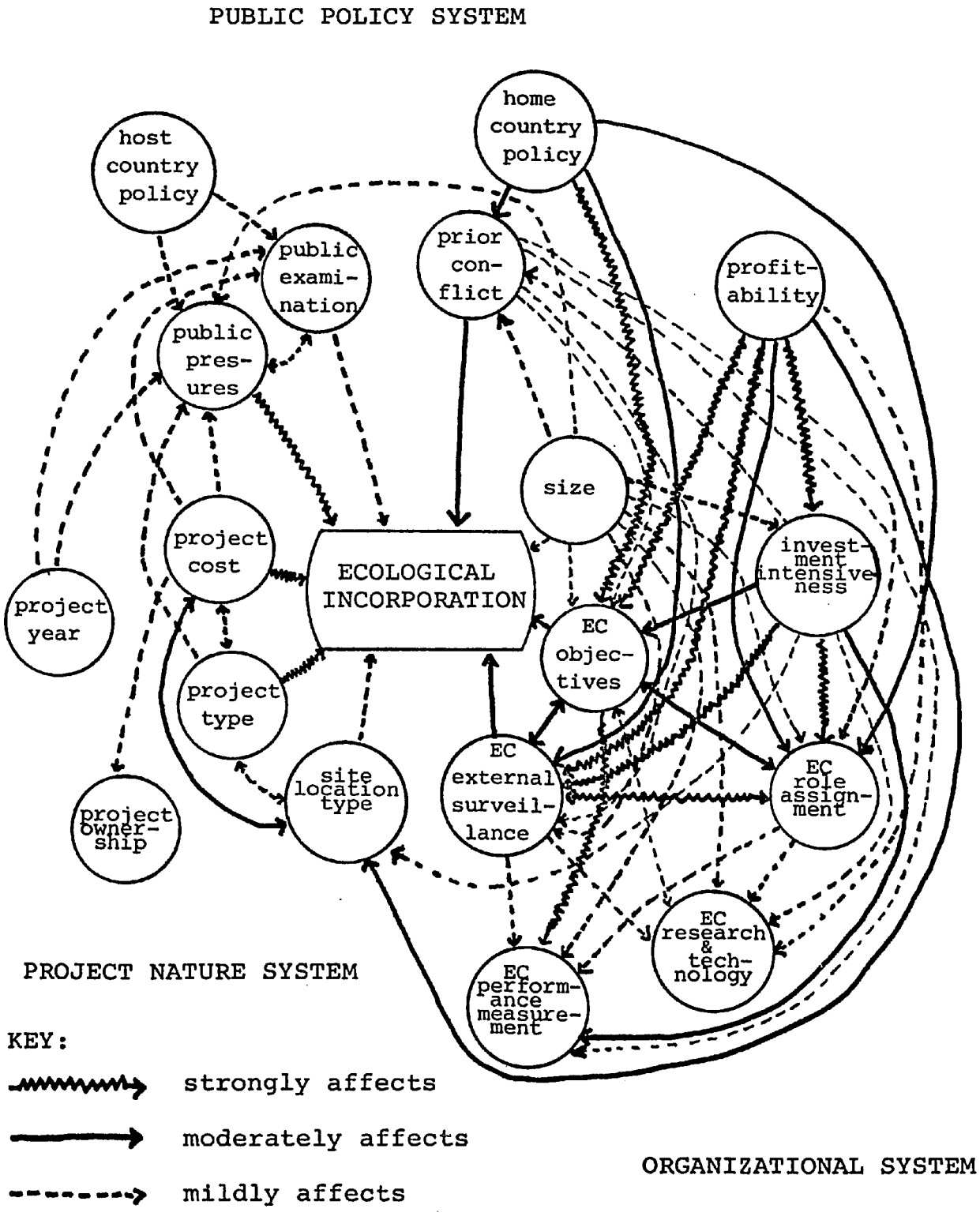
The Ecological Incorporation Embodied in the Project Planning Process Will be Greater . .	Hypothesis Confirmed?		Apparent Nature of Effect		Apparent Strength of Effect			Statistically Significant at the .10 Level?	
	Yes	No	Primarily Direct	Primarily Indirect	Strong	Moderate	Mild	Yes	No
16. the greater the extent to which prior discharge permissions, planning approvals, statements of environmental impact, and public interest hearings are required for the project (public project examination).	X		X			X		X	
17. the greater the intensity of governmental agency, citizen group, community and media resistance to the project and to similar prior projects in the same locality (project-associated public pressures).	X		X		X			X	
18. the greater the extent of prior external conflict experienced by the corporation on issues of environmental impact with publics and governmental bodies.	X		X			X		X	

achieved. Figure VIII.2 provides a graphic display of the system variables in its full complexity, as interpreted from the partial correlation analysis. The arrows flowing directly into the dependent variable of ecological incorporation are indicative of independent relationships, as inferred from the "lowest" first-order partial correlation investigation described above. The strength of these independent relationships vary. A coefficient of .15 to .26 is interpreted as "mild," a coefficient of .27 to .43 as "moderate," and a coefficient of .44 to .73 as "strong."

The arrows lying outside the ring of nine variables deemed to be exerting independent influence, represent net differences between zero-order and first-order correlations. The arrow indicating "strongly affects" going from home country policy to EC objectives, for example, represents an inference based on the results of controlling the relationship between home country policy and ecological incorporation for EC objectives. The zero-order correlation was .1330. When it was controlled for EC objectives, the partial correlation of home country policy with ecological incorporation dropped dramatically to -.3950. Through interpretation it was concluded that this was not indicative of a spurious relationship, but rather of a "true" developmental sequence. The relationship of home country policy to ecological incorporation is mediated by EC objectives. In other words, more comprehensive and active home country

FIGURE VIII.2

DETERMINANTS OF ECOLOGICAL INCORPORATION IN COMBINATION



environmental policy typically results in a firm adopting a deeper commitment to environmentally-responsible behavior; this, in turn, leads to a greater integration of environmental concerns into the project planning process.

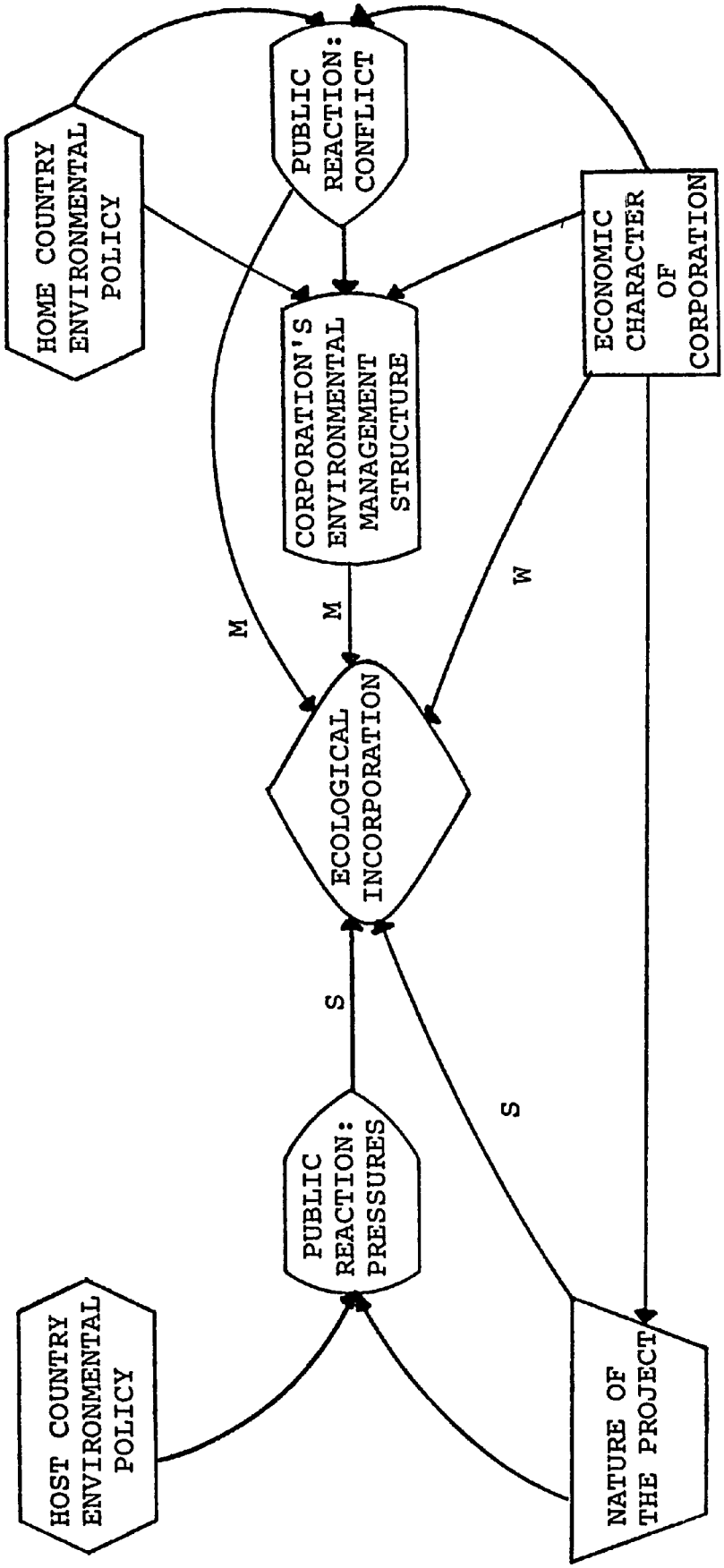
All of the arrows outside the middle ring on this figure were discovered in a similar manner and represent the complete collection of identified indirect linkages. The size of the difference between the zero- and first-order coefficients was interpreted as crudely indicating the strength of mediation. When the correlation dropped substantially (anywhere from .44 to .75), a "strong" indirect linkage was inferred. A "moderate" linkage was inferred from a drop between .27 and .43, and a "mild" linkage from a drop between .06 and .26.

This systems description of the determinants of ecological incorporation can be viewed only as a very preliminary attempt to understand how the variables possibly work in combination. Every link identified, however, appears at least plausible in theory. A review of some of the highlights of this system, with the aid of the consolidated and simplified version of the model in Figure VIII.3 constitutes the most useful way of explaining the probable determinants of environmentally-sound MNC project planning.

The extent of ecological incorporation appears to depend on five kinds of factors. The most powerful factor is the anticipated and actual reaction of various publics

FIGURE VII.3

SIMPLIFIED EXPLANATORY MODEL OF ECOLOGICAL INCORPORATION



in the host country to the proposed project. Project planners give dramatically more attention to issues of environmental impact when the expected or felt public reaction is perceived to be one of resistance to the project and/or intense demands for protection of environmental amenities. The second most powerful factor appears to be the intrinsic nature of the planned project. The type of project, its cost, and its site location are three important components of this intrinsic nature and appear to determine the need for ecological incorporation behavior. The third factor, of moderate importance, is the MNC's organizational structure for environmental management. This structure represents a package of variables (e.g., objectives, external surveillance, role assignment, and so on), which make innovative environmentally-oriented project planning feasible. The fourth factor is the MNC's past exposure, primarily in its home country, to public reaction in the form of conflictful interactions. This conflict experience appears to influence the planning process both directly and indirectly through its impact on the firm's environmental management structure. The fifth factor is the MNC's financial or economic character (i.e., its size, profitability, and investment intensiveness), which appears to have a weak direct effect, but a more powerful indirect effect via its role in determining the firm's exposure to conflict and organizational arrangements for environmental protection.

These findings can be interpreted originally, situationally, temporally, and functionally. The determinants of ecological incorporation appear to be primarily external in their origin.[3] Innovative planning behavior is largely externally induced by forces in the public policy realm, in both the MNC's home country and host country. In situational terms, the most powerful explanatory variables are project-specific (i.e., nature of the project and host country public reaction). Viewed from a temporal perspective, the prime determinants are contemporaneous (i.e., host country public reaction, nature of the project, and environmental management structure). Genetic factors, however, such as prior conflict, past exposure to home country policy, and economic character have also been found to be important. Prior conflict episodes appear to act as exogenous shocks, creating well perceived "performance gaps" and arousing the appropriate level of motivation to search for, and eventually adopt, new environmentally-oriented modes of planning behavior.[4]

The findings are most usefully interpreted in functional terms. Each of the variables identified above as being closely related to the innovation of ecological incorporation indicates either a relative presence of motivation or resources, or a relative absence of obstacles.[5] The primary <u>motivators</u> of ecological incorporation are public pressures, public examination, and prior conflict.

Incorporation behavior is also stimulated by the site location, cost, and type of project, for reasons of necessary information acquisition, risk reduction, and adverse impact avoidance, respectively. A MNC's objectives, external surveillance, profitability, size, and investment intensiveness can be viewed as resources which make ecological incorporation feasible. Deep-seated environmental protection objectives provide project planners with clear and powerful guidance. Extensive external surveillance facilitates the process of innovative planning by providing more exposure to new ideas, more feedback on the intentions of "normative reference groups," and more access to environmental knowledge and professional expertise. Profitability breeds "slack conditions" and enables the firm to devote more efforts to external monitoring and to adopt stronger "noneconomic" goals of corporate responsibility. Size and investment intensiveness allow the firm to reap the benefits of greater specialization in the assembly of skills and information required for ecological incorporation. The absence of any one of these resources could be viewed as an obstacle which inhibits incorporation. Narrow organizational goals (lack of environmental objectives), insensitivity to the external environment (little external surveillance and interaction), absence of slack (low profitability), and the inability to attain economies of scale (small size

or few new investment projects), all represent barriers to the adoption of ecological incorporation.

C. IN WHAT MANNER AND WHY?

1. In What Manner?

In what manner have ecological considerations been injected into the project planning processes of MNCs? Stated another way--what, how and when are these factors incorporated? The answers provided by this study are shown in Table VIII.2.

This table provides the percentage results of measuring and classifying the surveyed projects on the basis of twenty-six indicators of environmentally-oriented planning, grouped into six dimensions. On all but a few indicators, the behaviors of MNCs were found to extend over a great range, as is indicated by the distribution of percentages across the three possible categories. Keeping in mind this variation, the following observations can be offered on the "typical" pattern.

The bulk of the injection is achieved through "memory" rather than "active" search behavior. Rather than devoting time and energy in the current planning process to the development of environmentally-oriented project alternatives and to the assessment of environmental consequences of project actions, most MNCs tend to rely chiefly on their prior experience. Current project design choices are

TABLE VIII.2

ENVIRONMENTALLY-ORIENTED MNC PROJECT PLANNING BEHAVIOR

Dimensions and Indicators	% of MNC Projects Scoring: No or Low	Partly or Medium	Yes or High
A. Professional Involvement			
1. Current involvement of internal corporate environmental staff	7	40	53
2. Current involvement of external environmental professionals	33	13	53
3. Current involvement of multidisciplinary environmental expertise	40	7	53
4. Previous relevant involvement of environmental professionals	27	20	53
B. Systematization			
1. Prestartup ecological baseline survey	33	7	60
2. Formal preproject environmental impact assessment	53	20	27
3. Program of residuals discharge monitoring	7	7	87
4. Program of site location environmental media monitoring	53	20	27
5. Previous relevant environmental investigations	20	27	53
C. Inclusiveness			
1. Comprehensive prestartup ecological baseline survey	40	7	53
2. Environmental impact criteria employed in site selection	40	40	20
3. Environmental impact criteria employed in process technology selection	20	27	53
4. Comprehensive scope of environmental impact causing actions considered	47	20	33
5. Environmental impact criteria previously employed in design of process technology	13	53	33

continued--

TABLE VIII.2--continued

Dimensions and Indicators	% of MNC Projects Scoring: No or Low	Partly or Medium	Yes or High
D. Public Participation			
1. Utilization of locally-based environmental consultants	33	20	47
2. Surveys of local environmental values and perceptions	67	20	13
3. Active seeking of community and citizen group input	40	33	27
4. Initiation of community information program	47	27	27
5. Initiation of special educational efforts	53	7	40
6. Previous relevant interaction with publics on environmental aspects of project	7	47	47
E. Continuousness			
1. Early citizen participation in planning process	47	33	20
2. Early ecological baseline survey in planning process	33	40	27
3. Early inputs on environmental impact from previous experience	33	27	40
F. Formalization			
1. Environmental sections in internal project proposal	20	13	67
2. Top management environmental review and approval	53	33	13
3. Corporate environmental staff environmental review and approval	0	47	53

principally guided by the "pool of accumulated environmental knowledge" possessed by the MNCs by virtue of similar prior project planning experience and previous environmental research and remedial efforts carried out at similar existing facilities.

Environmental science professionals are frequently involved. The character of this involvement is most typically internal, part-time and engineering-oriented. Some use is made of systematic methods such as residuals-discharge monitoring and pre-startup site location baseline surveys. Planning attention is usually focused on issues of process-related residuals discharge, with only shallow attention generally being directed to potential environmental consequences associated with other project actions such as construction and transportation. The project planning process is typically secretive, exclusionist, low-profile, and "official-channels-only" in character. Participation of potentially-affected publics is rarely solicited. The incorporation of environmental considerations is discontinuous in nature, coming normally only at very late stages in the planning process. Finally, many MNCs have established formal rules and procedures for considering environmental factors during planning, but these largely relate to pollution control expenditure considerations and late stage environmental staff office project reviews. What explains the relatively high utilization of professional

involvement, the relatively moderate use of formalization, systematization, and inclusiveness, and the relatively low use of public participation and continuousness?

2. Why, In What Manner?

Ecological incorporation can be conceptualized as a package of highly interrelated innovations. The extent to which the MNC has adopted each of the innovations (i.e., the six dimensions) for use in its planning process appears to be explained partly by the contextual factors examined above, but more importantly by the characteristics of the six innovations themselves. Table VIII.3 relates the six dimensions to the nine most powerful independent variables identified in this study. With the exception of formalization, it appears that the dimensions most extensively employed in MNC planning are related more strongly and more widely to the contextual variables. The highly-utilized dimension of professional involvement, for example, appears to be strongly motivated or facilitated by most of the variables from all three influence systems. The least-utilized dimension of continuousness, on the other hand, is related only in a moderate fashion with a few of the variables. Fuller adoption of any one of the six dimensions thus appears to depend in part on the same kinds of factors which determine the adoption of overall ecological incorporation in the planning process.

TABLE VIII.3

KEY INDEPENDENT VARIABLE--ECOLOGICAL INCORPORATION DIMENSION CORRELATIONS[a)]

	Public Policy			Project Nature		
	Project Associated Public Pressures	Environmental Conflict Experience	Public Project Examination	Project Type	Project Cost	Site Location Type
Systematization	.5803*	.3064	.5568**	.4508**	.6375*	.3722***
Professional Involvement	.6067*	.3934***	.4689**	.5788*	.7673*	.4181***
Continuousness	.3464	.4572**	.0698	.4473**	.4161**	.2187
Inclusiveness	.7084*	.2090	.4814**	.6571*	.7710*	.3508
Public Participation	.5655*	.4313**	.3601	.6492*	.6643*	.3996***
Formalization	.2814	.7886*	.0349	.3649	.2913	.2430
Ecological Incorporation Composite Index	.5648*	.4080***	.4046***	.5820*	.6952*	.3892***

Continued--

TABLE VIII.3--continued

	Organization		
	EC Objectives and Top Management Commitment	EC External Surveillance and Interaction	Company Size
Systematization	.5214**	.4411**	.2729
Professional Involvement	.5246**	.4862**	.2284
Continuousness	.3890***	.4944**	.2850
Inclusiveness	.2032	.2596	.1016
Public Participation	.3441	.3588***	.1940
Formalization	.4223***	.6293*	.4116***
Ecological Incorporation Composite Index	.5087**	.4938**	.2706

a) Kendall Rank Correlation Coefficients (tau); significance levels: * = .01 level, ** = .05 level, *** = .10 level.

The manner of ecological incorporation can possibly be more powerfully explained by examining the characteristics of the six dimensional innovations. The six dimensions of ecological incorporation can be characterized along a series of seven attributes which help to explain the extent to which each is currently utilized in project planning.

Utilization appears to be negatively related to: 1) required investment--the degree to which the dimension requires an investment (time, skills, and money) of large size,[6] 2) complexity of use--the degree to which the dimension is perceived as difficult to understand and use,[7] and 3) associated risk--the degree to which use of the dimension entails high risk or uncertainty.[8]

Utilization appears to be positively related to: 1) knowledge about--the degree to which knowledge of the dimension's existence and understanding of its potential is widespread,[9] 2) compatibility--the degree to which the dimension is perceived as being consistent with existing values, past experiences, current processes, and needs of the organization,[10] 3) trialability--the degree to which the dimension may be experimented with on a limited basis,[11] and 4) relative advantage--the degree to which the dimension is perceived as better than the idea it supersedes.[12]

Exhibit VIII.2 presents this researcher's judgments as to how MNC planning executives currently perceive the six dimensions in terms of these seven attributes. The

EXHIBIT VIII.2

CHARACTERISTICS OF DIMENSIONS OF ECOLOGICAL INCORPORATION

Dimension	Extent of Current Utilization	Required Investment	Complexity of Use	Associated Risk	Knowledge About	Compatibility	Trialability	Relative Advantage
Professional Involvement	high	mod.	low	mod.	high	high	high	high
Formalization	mod.	low	low	low	mod.	mod.	high	mod.
Systematization	mod.	high	mod.	mod.	mod.	mod.	high	mod.
Inclusiveness	mod.	high	high	mod.	low	low	mod.	low
Publi Participation	low	high	high	high	low	low	mod.	low
Continuousness	low	high	high	high	low	low	low	low

dimensions are listed from top to bottom in order of decreasing extent of current utilization. Professional involvement appears to be highly utilized because it is relatively inexpensive, simple to use, not very risky, well understood, fully compatible with existing systems, readily triable, and in general is perceived to be quite profitable. Public participation, on the other hand, appears to be utilized infrequently because it can have a high cost relative to the firm's planning resources, involves political, psychological and social processes which are complex, entails a high risk that the participation might "backfire" and lead to delays or exorbitant expenditures, is not well understood and cannot be imitated because prior experience with it by all firms has been slight, is viewed by many as a radical departure from tradition and by some as threatening, is hard to experiment with on a trial basis, and in general is perceived as having low current value.

From this crude classification, one can make the following summary prediction--the extent to which a MNC adopts and utilizes an innovation related to environmentally-oriented project planning is a decreasing function of the size of the investment required, the complexity of use, and degree of associated risk, and is an increasing function of the proportion of MNCs already using it, widespread knowledge about it, compatibility with existing planning

activities, ready trialability on an experimental basis, and the profitability or value of doing so.

FOOTNOTES

CHAPTER VIII

[1]See: Hubert M. Blalock, Jr., Causal Inferences in Nonexperimental Research (New York: W. W. Norton, 1972), Chapter 3: "Evaluating Causal Models."

[2]For discussions of the techniques involved in, and benefits of, partialling see: Hubert M. Blalock, Jr., ed., Causal Models in the Social Sciences (Chicago: Aldine, 1971), and Sanford I. Labovitz, "Methods for Control with Small Sample Size," American Sociological Review, 30 (April, 1965), pp. 243-249.

[3]This is consistent with Terreberry's hypothesis that organizational change is largely externally induced by forces in the environment. See: Shirley Terreberry, "The Evolution of Organizational Environments," Administrative Science Quarterly, 12 (March, 1968), pp. 590-613.

[4]This finding fits in nicely with the general performance gap model of organizational innovation as first advanced by: Anthony Downs, Inside Bureaucracy (Boston: Little, Brown and Co., 1966), pp. 169-208, and subsequently extended by: Gerald Zaltman, Robert Duncan, and Jonny Holbek, Innovation and Organizations (New York: John Wiley, 1973).

[5]Mohr has suggested that organizational innovation is the function of an interaction among the motivation to innovate, the strength of obstacles against innovation, and the availability of resources for overcoming such obstacles. See: Lawrence B. Mohr, "Determinants of Innovation in Organizations," American Political Science Review, 64 (March, 1969), pp. 111-126.

[6]This attribute is suggested in: Edwin Mansfield, Industrial Research and Technological Innovation (New York: Norton, 1968), pp. 146-148.

[7]See: Everett M. Rogers and F. Floyd Shoemaker, Communication of Innovations: A Cross Cultural Approach (New York: The Free Press, 1971), Chapter 4.

[8]See: James M. Utterback, "Innovation in Industry and the Diffusion of Technology," Science, 183 (Feb. 15, 1974), p. 624.

[9]See: Kenneth E. Warner, "The Need for Some Innovative Concepts of Innovation: An Examination of Research on the Diffusion of Innovations," Policy Sciences, 5 (1974), pp. 435-438.

[10]See: Rogers and Shemaker, op. cit.

[11]Ibid.

[12]Ibid.

CHAPTER IX

POLICY IMPLICATIONS AND SUGGESTIONS FOR FUTURE RESEARCH

A. INTRODUCTION

> Man has the fundamental right to freedom, equality and adequate conditions of life, in an environment of a quality which permits a life of dignity and well-being, and bears a solemn responsibility to protect and improve the environment for present and future generations.[1]

This first principle of the Declaration on the Human Environment adopted at the U. N. Conference on the Human Environment gives rise to many implications for the present institutionalized system of societal planning and decision making. To borrow from Daniel Bell, it implies that the conventional "economizing" mode of planning, oriented narrowly to economic efficiency, must give way to a "sociologizing" or "environmentalizing" mode, in which plans are formulated and decisions are taken on the basis of broader social and environmental criteria.[2] Achievement of this principle calls for a replacement of the traditional private interest point of view by a public interest perspective in evaluating the optimal use of resources in terms of social and ecological objectives and consequences.[3]

The implications for multinational corporations, governments, and researchers in making the transition to this new mode of "environmentalized" planning are multifarious and perhaps revolutionary. For MNCs, there is a need to adopt an environmentally-oriented approach to project planning. For governments, particularly at the national level, there is a need to design a system of regulation in order to effectively guide the planning behavior of MNCs. For researchers, new priorities and strategies, at both the descriptive and normative level, are needed in order to help guide the formulation of environmentally-oriented policy and practice. The following three sections of this chapter present expanded discussions of the implications for these three groups respectively.

B. IMPLICATIONS FOR MULTINATIONAL CORPORATIONS

1. The Need for Change

Project planning behavior in most MNCs is still unecological. Natural processes are often disregarded and full consideration of environmental values is typically absent. Project planners are not going through the intellectual exercise of asking "what impact do our decisions have on the environment?" These tendencies suggest that MNCs need new environmental strategies and modes of planning behavior.[4] In addition to this need, publics throughout the world are increasingly demanding that an ecological

dimension be added to the management of MNC activities. These demands are part of the new social contract that is emerging for business which requires the making of profits in such a way as to minimize social and environmental injury.[5] An ecological approach to management is thus necessary if MNCs are to retain legitimacy in the eyes of the world.

Convincing evidence can be gathered which suggests that environmentally-oriented planning makes good economic sense. As recognized by the International Chamber of Commerce in its recent "Environmental Guidelines for World Industry," sound environmental planning is in the "vested self interest" of MNCs.[6] Five economic reasons indicate that such planning can be cost-effective.

First, plant design and siting decisions which were once relatively simple, have become a matter of bewildering complexity and multiple pitfalls, where a relatively minor error can defeat a multimillion dollar project. As Chevron and American Metal Climax have discovered in the U.S., a careful and environmentally-oriented mode of planning can smooth the path for expansion by helping to clear the countless social and environmental hurdles involved.[7]

Second, environmentally-sound project planning can help to lower the probability of blocked or rejected projects such as were experienced by BASF and Shell in the U.S., and Akzo and ESTEL in the Netherlands.[8] These projects and

many others were halted primarily due to a failure to cope with environmentally-based objections. Impact assessment at an early stage of planning is likely to reduce the chance of cancellation by giving planners the means by which to identify, modify, and mitigate the sources of these objections.

Third, pre-project environmental assessment can help to avoid the delays imposed when plans or project designs have to be reconsidered for possible environmental effects at a late stage of the planning process. As ESSO-BHP in Australia, Pfizer in Ireland, Bayer-BP in West Germany, and Alyeska in the U.S. have found out, delays can be costly, especially in terms of higher construction costs due to inflation, lost opportunities, and tied up managerial manpower.[9]

Fourth, sound pre-project environmental planning can help to reduce the potential of intense and protracted conflict episodes. The damaging publicity resulting from such episodes, such as was received by U.S. Steel and Union Carbide in the U.S., August Thyssen Hütte in West Germany, and Montedison in Italy, can have high costs in terms of community goodwill, public image, and employee morale.[10]

Fifth, environmentally-oriented planning can help to avoid the additional costs required to rectify adverse environmental consequences after the fact. Forced closings such as were required of Gulf Oil in the Netherlands, Rio

Tinto Zinc in the United Kingdom, and Reynolds Metals in West Germany, and major conversions, such as were required of Dow Chemical in Canada and Reserve Mining in the U.S., can be very expensive.[11]

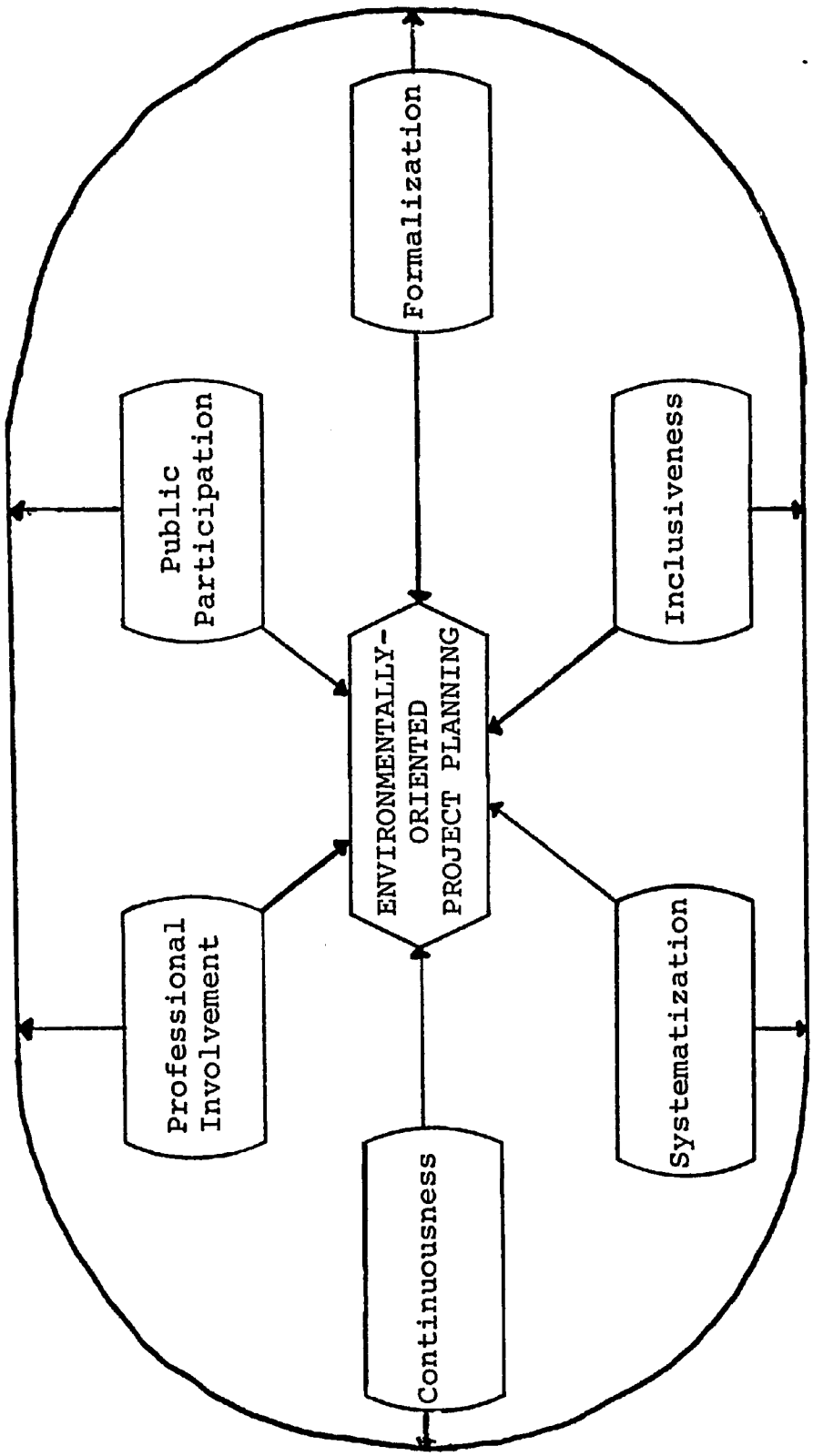
2. A New Mode of Planning

What constitutes an environmentally-oriented mode of planning? What kind of planning will help to smooth managerial paths and to help avoid delays, terminations, conflicts, forced closings, and major conversions? The answers to these questions are only beginning to emerge. It is certain that no magical or foolproof "cookbook recipes" can yet be offered. A normative interpretation of the measurement model developed in Chapter 2 may, however, represent a useful point of departure.

As shown in Figure IX.1, environmentally-oriented project planning can be conceptualized as consisting of six interdependent dimensions. The objectives of this mode are more informed, and more socially desirable, choice among a range of alternative actions.[12] The mode consists of a set of procedures through which conscious choices can be made in the context of the fullest practicable knowledge of their consequences. Success in planning is judged by how well the design of the project fits the broadly defined environmental setting into which it is being introduced. The model is applicable not only to the planning of new

FIGURE IX.1

DIMENSIONS OF ENVIRONMENTALLY-ORIENTED PROJECT PLANNING



facilities, but also to the planning of products, transportation methods, operational health and safety procedures, and so forth.[13]

3. The New Mode: Dimensions and Difficulties

Each dimension of environmentally-oriented project planning serves a purpose, can be translated into a set of operational procedures, and entails certain difficulties or limitations. Since much has already been said about these dimensions in Chapters II and IV, only some of the more important aspects of each dimension are highlighted below.

a. Professional involvement

Sound planning which covers a broad range of environmental concerns requires the input of experienced, multidisciplinary, and professional judgment. This input is essential in order to take off the "mental blinders" associated with conventional engineering and economic expertise. The MNC can derive this professional involvement by either creating an "in-house" pool of specialized professionals or by drawing on external consultants, especially in the host country of the project. Insuring the proper amount of professional involvement will be a problem of institutional design in part, but more importantly, will be a very complex issue of interpersonal dynamics. The various conflicts between scientists and managers, specialized experts and generalized decision makers, and line and staff

will all be present.[14] Coordinative mechanisms, such as working teams and integrated reports, will also need to be devised so that project planning from diversified inputs may have coherence.

b. Public participation

Planning which is to be anticipatory and sympathetic will require a much broader and more extensive participation in the process by those who will be directly affected by the project. Broadened participation is necessary if MNC planning is to retain its legitimacy in an age of "participatory activism."[15] Provisions for wide ranging and continuous consultations, full and early disclosure, information programs designed to inform and not to convince, community opinion survey research, and so forth will need to be built into the planning process. Greater public participation will not be easy to achieve. It will be time consuming, tedious and costly, and will increase the firms' vulnerability to disruption, harassment, and agonizing delays. In spite of these difficulties, the pluralist uprisings currently taking place in many nations signal that a "closed" mode of planning soon will no longer be viable. "Open" planning will be necessary, and the practical problem will be to devise methods to incorporate greater public participation while preserving the degree of control required for orderly operations.

c. Inclusiveness

Since large scale projects have pervasive impacts on the human environment (the intricate system of living and nonliving elements held together by complex relationships), sound planning will require a truly holistic and comprehensive point of view. Systems thinking will need to be applied to the project, to alternatives, to the environment, and to impacts.[16] Full comprehensiveness, in the sense that all linkages and all alternatives are considered, of course will never be possible given the costs of time and information, and elements of uncertainty. Since the ability to act with full knowledge of the available alternatives and their consequences is an unobtainable luxury, project planners will need to devise methods for determining how much resources should be devoted to procuring what pieces of information and to reducing which uncertainties. Some guidelines dealing with this question of "exclusiveness" are now emerging.[17]

d. Systematization

The difficulties inherent in putting complex environmental incommensurables into the decisional balance, and the need for an objective understanding of the consequences of alternative actions require that the environmental assessment thought process in planning be structured and systematized. A wide range of techniques, as shown in Exhibit IX.1, are potentially applicable for use in project impact

EXHIBIT IX.1

ENVIRONMENTAL ASSESSMENT TECHNIQUES

Description	Prediction	Evaluation
base mapping	brainstorming	component value analysis
baseline surveys	cause-effect matrices	constraint setting
checklists	cross-impact gaming	cost-benefit analysis
computer & overlay mapping	Delphi technique	display formats
content analysis	expert position papers	factor profiles
contextual mapping	growth-envelope curves	graphic illustration
cross impact matrices	historical analogy	input-output analysis
dynamic & causal modelling	intuitive reasoning	multiple factor analysis
gaming	predictive mathematical models	multi-objective accounting
listening sessions	professional judgment	quality indices
network diagrams	relevance trees	sensitivity analysis
opinion survey research	scenario building	suitability analysis
residuals & impact monitoring	simulation	visual resource analysis
stepped matrices	trend extrapolation	weighting procedures

assessment: systems description, impact prediction, and impact evaluation. Most of the available methods, however, are crude, and most have not been widely tested. The development of integrated sets of methodologies for the total process of impact assessment is just beginning. The absence or relative paucity of scientific knowledge necessary to assess impacts is also a complicating factor. This should not be overemphasized, however, because the greater immediate need is for effective application of ecological principles that are already known. The difficulties of imperfect knowledge and crude tools imply that environmental assessment can currently be considered more of an art, rather than a form of exact science. The need for, and importance of, performing environmental assessment, however, is such that attempts to deal with it cannot be deferred on excuse of its difficulties. It is necessary to grapple, however imperfectly, with the tools and data that are currently available.

e. Continuousness

Sound planning requires that environmental considerations and impact assessment be fully integrated at each stage of the entire planning process, as well as throughout the actual operations of the planned project. This is so because decision points involving a balancing of environmental and non-environmental factors are scattered from the very beginning to the very end of a project's lifetime. The

critical need is for early consideration, before alternate sitings and possible mitigative design actions are foreclosed. The evolutionary process of project design will necessitate a corresponding process of environmental assessment which is performed at increasing levels of detail throughout the planning process.[19] The foremost implication of continuous integration is that the time needed for obtaining environmental information, interacting with affected publics, and analyzing and evaluating impact predictions will need to be built into the scheduling and budgetary requirements of projects. Extending the degree of search and increasing the diversity of alternatives considered will of necessity lengthen the planning period, but not unduly if environmental considerations are introduced as early as possible.

f. Formalization

If environmental assessment in the context of project planning is to be careful and serious, formal rules and procedures will need to be established for guiding the effort. A continuous consciousness of environmental considerations will be achieved only when "action forcing provisions" are introduced to hold project planners accountable for their decisions.[20] A wide range of "action forcing" mechanisms are available including internal impact statement requirements, environmental staff and top management

project reviews, environmental performance evaluations of project planners, and so on. These mechanisms may be frightening to conventional planners and will therefore need to be clearly and strongly communicated, and consistently supported, by top management. Their creation will necessitate modification in a number of existing management systems, including divisional autonomy, performance measurement, and executive reward and evaluation.[21]

4. The New Mode: Facilitating Organization Adjustments

Given that the mode of environmentally-oriented project planning, as outlined above, is judged to be desirable, how can its adoption be encouraged or facilitated by the top management of MNCs? As has been found by Aharoni and Bower,[22] and reconfirmed in this study, the path of the project planning process may be swayed by a number of organizational variables. These variables can be viewed as "points of leverage" which management has at its disposal to influence the inputs, means, and inevitably the outputs of the project planning process. These leverage points are found in the MNC's "environmental management structure" and serve to define the "rules of the game" under which project planning is carried out.

As discovered in this study, a MNC's objectives for environmentally-responsible behavior appear to influence the behavior of planners. When objectives of responsible

behavior are held only weakly by the firm, project planners tend to be subject to the many vagrant pressures, from within the firm and from without, to disregard concerns of environmental impact. When the objectives are deep-seated, expressed in leadership terms, applied globally, consistently supported by top management, and backed up by reinforcing performance measurement and reward systems, the behavior of project planners is almost always environmentally-oriented. In short, the attention of planners will be focused on environmental impact problems when they clearly perceive that resource allocation decisions and their careers depend on it.

This study has also found that environmentally-oriented planning is more likely when the firm as a whole engages in a wider and deeper interchange with its external surroundings, particularly with organizations concerned with environmental protection. Sensitive external scanning and extensive interorganizational relations are in Buckley's terms, key sources for the continuous introduction of variety into the firm's information system.[23] Greater openness allows more feedback, more exposure to new ideas, more observational learning, and thus facilitates more flexible and adaptive planning behavior. Greater openness also provides the firm with greater environmental knowledge and as White stated: "Knowledge of the environment is knowledge of the probable consequences of action."[24] With such

knowledge a firm's planners are better able to select and identify viable design actions, and to identify the external values which should guide their internal behavior. Organizational adjustments which serve to increase the MNC's sensitivity to external change, or allow it to better reflect the external milieu in its own structure, should thus be conducive to environmentally-oriented planning.

Other leverage points might include the creation of new roles and the creative use of trauma. Useful catalytic functions might be served by creating positions such as "project environmental advisor" or "corporate environmental coordinator." Environmentally-oriented planning might also be activated by creating "interdisciplinary project review committees" or "community and scientific advisory panels." Using a conspicuous incident (i.e., a blocked or delayed project due to obviously poor environmental planning) as a corporate-wide learning experience might represent the best way of emphasizing the "relative advantage" of the new mode of planning. Top management could creatively intervene in the incident, using it as a test case to set a well established precedent regarding the need for environmentally-oriented planning.

C. IMPLICATIONS FOR GOVERNMENTS

1. The Need for Change

MNC projects are currently not being assessed carefully for their environmental consequences. The lack of such assessment and mitigating action at the planning stage generally means that the outcomes of these projects are likely to include environmental effects of a negative or harmful character. Generation of these "externalities" or social costs implies that too much of the goods associated with these projects are being produced (because output prices are too low) and that socially inefficient production techniques are being chosen. In addition to an inefficient allocation of resources, it also presents a question of equity, because MNCs are obtaining income by causing damage to others.

In the presence of externalities the allocative rationale of the free market is diminished. Intervention in the public interest is required in order to equate private and social cost.[25] In the context of new project planning, regulation is justified in order to ensure the internalization of costs which might otherwise be externalized or imposed on the larger society.

The fact that preventive assessment is not being done and environmentally injurious practices are being perpetrated indicates that present regulatory and institutional frameworks are immature. In many nations the

existing frameworks of social controls established over private enterprise project planning are disorganized, inefficient, inequitable and special-interest-oriented. Many societies either still do not know what their rules should be, or are in the process of formulating them and do not have appropriate safeguards. Since this study has found that the most powerful levers for effectuating change in the environmental behavior of MNCs lie in the public policy realm, the need for regulatory reform within this realm is critical.

2. A New Mode of Control

The ultimate aim of regulatory control over MNC project planning should be outcomes that are in the public interest and that are arrived at by procedurally equitable means.[26] Outcomes in the "public interest" require that MNCs be guided to select socially-cost-minimizing production techniques. Outcomes that are arrived at in an "equitable" manner require that the full agenda of "affected interests," including the interests of future generations, be considered and mediated in the process of project planning.

Achieving these aims requires a refashioning of the incentive systems which guide economic decision-making in the private sector. This entails the creation of an "influence or compliance structure" consisting of a set of controls that will effectively internalize prospective

externalities.[27] Viewed in innovation terms, it involves the use of intervention techniques for facilitating the diffusion and adoption of the "environmentally-oriented planning innovation" believed to be in the "public interest." Adoption may be encouraged by incentives designed to increase the "relative advantage" to be gained from adoption or to reduce the risks associated with adoption.

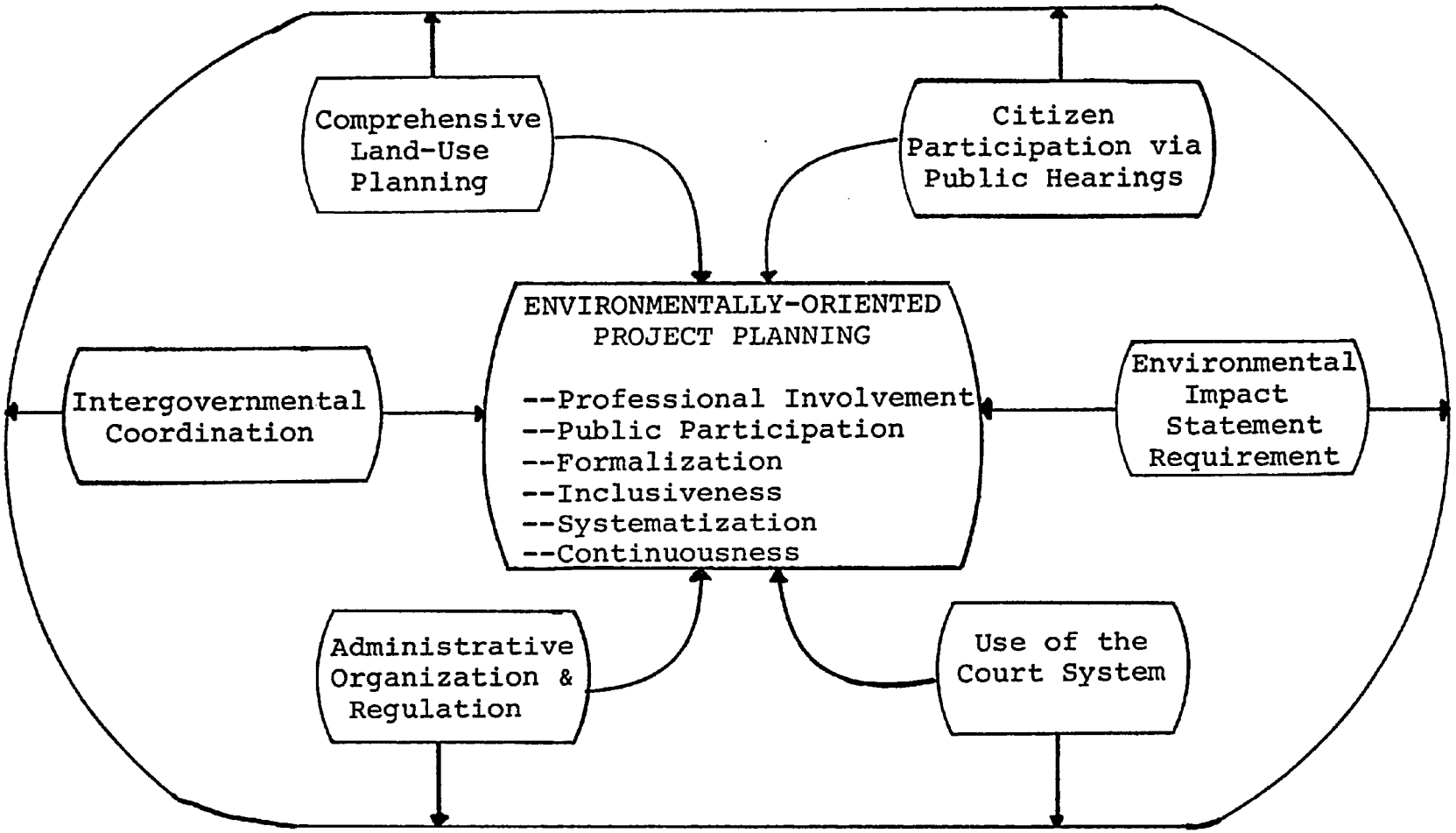
3. The New Mode: Possible Components

A wide range of techniques are available to governments for use in changing the environmentally-damaging behavior patterns of MNCs into more environmentally-congenial ones.[28] Just as top management can manipulate pressure points within the firm, so too can public policy makers utilize points of leverage outside the firm. Many leverage points or techniques can be enumerated, but it is not practicable or possible to establish priorities among them for all countries. Differences in environmental needs, social systems, and political systems among nations imply that differences in public policies are necessary and desirable.

Six techniques which appear to be fairly powerful, as demonstrated in one or more of the countries included in this study, are briefly highlighted below. Figure IX.2 shows that each is capable of motivating or facilitating environmentally-oriented planning behavior on the part of MNCs. In addition, each of the six is highly interrelated

FIGURE IX.2

GOVERNMENTAL TECHNIQUES FOR ENCOURAGING ENVIRONMENTALLY-ORIENTED PROJECT PLANNING



with the others. The benefits and limitations of each are reviewed below, not for the sake of recommending their use in all nations, which would be inappropriate, but only for contributing to a sharing of experience among nations with regard to a few policy techniques that have been found useful.

a. Comprehensive land use planning

The key to long-term environmental protection and enhancement probably rests with broadened control over land use.[29] The use and misuse of land is inextricably bound with social, environmental, and economic concerns. Regional physical planning thus represents the "focal point" or "umbrella" under which the implementation of all environmental laws and regulations can be coordinated. Environmentally-sound MNC siting decision cannot be properly made, and project impact assessments cannot be properly conducted, without a foil of regional land use data and criteria. A comprehensive master plan of future land use, with stringent performance standards, can be of considerable value to planners by allowing them to determine how their project might or might not fit in.

Some nations have been able to develop national land use plans, but most have only been able to give attention to "critical land use areas" of historic, scenic, or ecological value.[30] Coastal areas, wetlands, and

estuaries have recently been receiving increasing attention.[31] The political and practical problems of broadening control over land use in the public interest are formidable. The concept, especially within the U.S., conflicts with notions of private property rights and to the traditional philosophy of real estate acquisition and development. The challenge for public policy makers in many governments is to guide the transition from the present "short-term--special interest--local" nature of land use decision-making to one which is more "long-term--public interest--regional" in character.

b. Environmental impact statement requirement

Requiring formal environmental impact statements to be written for proposed projects has been found in Australia and the United States to be a powerful lever for making MNCs more responsive to environmental considerations and values. Recently the Environmental Ministers of all the O.E.C.D. nations jointly recommended that a priori impact assessment should become a basic tool of national environmental policy.[32] Sweden, Denmark, France, and Canada are currently in the process of devising environmental assessment procedures.[33] The impact statement requirement could fruitfully be made a part of the MNC entry evaluation and investment screening procedures which are evolving in many host nations.

The environmental impact statement requirement, however, is no panacea for ensuring that MNC projects will have a minimal adverse effect on the environment. The effectiveness of the impact statement device has been questioned on many grounds.[34] As Cramton and Berg have analogized, the device is "useful for leading horses to water but doesn't determine whether they drink."[35] The preparation of an impact statement merely increases the probability that planners will have considered matters beyond the immediate economic and technical impact of the proposed project. It implies nothing about how much weight was given to environmental factors in the balance by which the final decisions were reached. Many impact statements written to date have been self-serving justifications of planning decisions already made for other reasons. The nagging problem is: given the assessment of environmental consequences expected from a proposed project, who should make the go/no go decision and what weights should be assigned to the environmental and non-environmental factors involved? A related issue is who should ideally conduct the assessment? Environmental studies sponsored by the project's proposer are rarely impartial, yet the institutional arrangement for assessment conducted by bodies independent of the principals involved are not yet available. In addition, the viability of assessments conducted separately from the ongoing planning process is seriously questioned.

c. Citizen participation via public hearings

Broadened citizen involvement in the MNC project planning and approval process represents a powerful mechanism for helping to assure responsive and responsible decisions. Since MNCs will rarely respond to interests not represented or advocated in their deliberations, a more adequate representation during the course of planning of all interests affected by the project is necessary if these interests are to be considered. Citizen participation can contribute to the generation of relevant alternatives, can provide a "collective reality testing" of the information used by planners, and can result in greater public acceptance of the ultimate project decisions.[36]

Public hearings on MNC projects subject to administrative approval can be a useful way of building citizen participation into the planning process. Such hearings provide a focus for "affected" persons and groups, serve to marshall and elucidate the available information, and require the MNCs to articulate and explain the basis of their judgments. Efforts can also be taken to reduce the many barriers to effective citizen participation in such hearings. For example, counsel can be provided to community groups that are frequently unrepresented or underrepresented, and informational programs to provide the community with

knowledge about the expected impact of the project prior to the hearings can be initiated.[37]

The proper role and scope of citizen participation in MNC project planning is a complex issue that is currently not well conceptualized. Two things are certain, however: 1) the existing planning processes employed by MNCs are not structured to allow the natural, positive inclusion of citizen input, and 2) the professional fears, biases, and difficulties of including such input are great. The dangers of too much participation, as viewed by MNC executives, are that the efficiency of project planning might be greatly hindered. They fear that excessive participatory activism could lead to loss of control, delay, and disruption. The real issue, however, is not private efficiency versus citizen participation, but is the derivation of equitable outcomes of decisions.[38] The fundamental task for policy makers is to devise structural innovations for effectively integrating citizen participation into planning in the private sector, such that equitable and legitimate outcomes can be achieved in an efficient fashion.

d. Use of the court system

Joseph L. Sax sees the idea of broadened citizen participation as outlined above as "attractive, but its practical implementation elusive."[39] He argues instead for an enlargement of adversary processes by broadening the

citizen's right to bring suit and investing the courts with wide-ranging authority to resolve environmental questions.[40] The right to challenge MNC decisions which have impaired, or are likely to impair environmental quality, would be greatly facilitated by enacting legislation allowing citizens to bring environmental lawsuits without having suffered any special personal injury, economic or otherwise.[41] MNCs would be more likely to seriously consider environmental factors during planning if they knew that citizens had ready access to judicial enforcement and potential vindication of environmental values.

The adversary environmental citizen suit and judicial involvement is clearly inappropriate for nations which rely on a consensual policy process and where judicial structures do not have a strong position in policy implementation. Even where appropriate, the proposal entails a range of shortcomings.[42] Is the court's authority over environmental decision-making legitimate? Does the judicial system possess the technical competency and institutional capacity to deal with a great number and range of complex environmental issues? Would such public interest lawsuits clog up the court system? How would citizens be able to bear the frequently enormous expense of litigation? These and other questions need to be addressed by public policy makers in deciding on the proper role and scope of citizen litigation in protecting the environment.

e. Administrative organization and regulation

One powerful factor that appears to influence the behavior of MNC planners is the presence of effective governmental organization and administration for environmental protection in the host nation. The creation of policy-making and policy-implementing organizations serves to visibly and forcefully institutionalize the advocacy of environmental values within the nation.

Lynton K. Caldwell argues that all national governments face a common problem of organization to cope with the complex, ramifying, and evolving character of man-environment interactions:

> To cope with major environmental problems there is need for administrative organization that a) is sufficiently comprehensive to encompass the problems under attack, b) facilitates coordination of all significantly related efforts, c) is adaptable to the dynamics of environmental change and to progressive stages in the solution of environmental problems, and d) is capable of obtaining, evaluating, and applying the appropriate science and technologies to the problems.[43]

The problem for policy makers is to develop administrative organizations possessing the above stated capabilities and to devise environmental policies, with action forcing provisions, to serve as guides to legislative and administrative implementation.[44] Government machinery doesn't always work, however. Regulatory agencies often become captives of those whom they are supposed to regulate.[45] In addition, they are often hampered by political

appointments and controversies, are unable to attract and hold qualified staff and research personnel, are burdened by purely administrative demands, and are unable to actively investigate in the public interest due to a lack of resources.[46] Administrative and regulatory failure in the area of environmental protection often means inefficient or inequitable control over MNC project planning.

f. Intergovernmental coordination

Better coordination among the great many government agencies typically concerned with a new MNC project might serve to expedite a more environmentally-oriented planning process. MNCs are often faced with a terribly fragmented, complex, and cumbersome permit-gathering procedure for new projects. A few of the projects investigated in this study required over 25 different licenses or permits from regulatory agencies at many levels of government.

Jurisdiction over the environmental effects of a MNC project in most nations is widely scattered. Government agencies are often in competition with one another, and there is commonly considerable vertical and horizontal duplication of interests. MNCs frequently must play a mediating role among overlapping environmental jurisdictions. Fragmentation in project regulation not only is costly, tedious, and time-consuming for the firm, but also tends to work against comprehensive project impact assessment. In

many instances an agency is only concerned with one piece of the project and gives its approval or disapproval without seeing the total picture. Lacking the resources for an adequate investigation, it tends to make its decisions on the sole basis of evidence presented by the interested parties. The MNC often takes advantage of regulatory fragmentation by attempting a "snowball" strategy--it gets pieces of the project approved and creates a powerful momentum which gets the rest of the project approved.

A relatively rapid "one stop permit" for construction and operation obtained from an intergovernmental project assessment coordinative body probably represents an ideal, but practically unrealizable goal at this point in time. The conflicts of authority and philosophy among governmental bodies at different levels are not going to be easily resolved. Better exchange of information, attempts at coordinated planning, and experiments with the intergovernmental regulatory "team concept" should, however, be attempted.[47]

D. IMPLICATIONS FOR RESEARCHERS

A number of implications for researchers emerge from this study. These relate to perceived current research gaps, extensions and refinements of the developed constructs, and future research strategies and priorities. The implications have been organized into nine topics in three research

areas: 1) planning and environmental assessment, 2) organizational adaptation and innovation, and 3) international environmental management.

1. Planning and Environmental Assessment

a. Participatory planning

Citizen participation still remains outside the conventional planning process. New conceptualizations of the planning process that appropriately and structurally integrate citizen participation are needed.[48] Structural innovations which would lower the many barriers to effective citizen participation also need to be devised, applied, and tested. Experiences with relatively "open" planning need to be investigated, analyzed, and reported in the literature.

b. Pragmatic environmental impact assessment

The models of environmental impact assessment which are currently emerging are too often overly normative and organizationally impractical. A more pragmatic approach, which realistically attempts to deal with the dynamic nature of the planning process and which fully recognizes "real-world" obstacles, constraints and pressures, is required. Many MNC and governmental planners have accepted the need for impact assessment in theory, but are now desperately searching for workable guidelines on how to go about it.

The practical difficulties of dealing with uncertainties and of determining which alternatives and impacts should be studied are items which particularly deserve a great deal more attention in the impact assessment literature.

c. Environmentally-oriented product planning

A refined version of the "ecological incorporation" construct devised in this study could easily be applied to the area of product planning. The principles at stake are the same--a perturbation is being introduced into a complex environmental system from which first- and higher-order impacts and consequences are likely to arise. Attention to product-related environmental issues has only belatedly emerged in MNCs, and the implications for product line and development decision-making are far-reaching.[49] Methods of impact assessment are essential if the substitution of less "energy-resource-pollution" intensive products for more "energy-resource-pollution" intensive products is to be hastened.

2. Organizational Adaptation and Innovation

a. Role of external conflict in organizational change

This study has found a MNC's previous conflict experience to be an important determinant of its current organizational structure and planning behavior. More theory and empirical evidence is needed on the dynamics of conflict,

cooperation, and conflict resolution in relation to organizational change. An improved understanding of the causes, course and consequences of conflict over environmental issues is especially needed.[50] This is so because the outcomes of many environmental conflicts have not always been substantively "fair" or in the "public interest."

b. External determinants of organizational innovation

Organizational innovation in the area of environmental management was found in this study to be primarily externally induced. Far too little attention has been given in innovation and diffusion research to the role of external variables. More needs to be discovered as to how external changes cause innovation in the organization. In addition, we know very little about MNCs as "adaptive learning systems." Such knowledge would seem to be particularly valuable in these times of rapid global change. What are the adaptive characteristics required for viable multinational operations in the next decade? What factors induce or block adequate and rapid learning?

c. Institutionalization of social issues

Little attention has been devoted to the implementation of policy in areas of social concern.[51] There is as yet no integrated theory of corporate institutionalization of social demands. This study has found evidence of a

response cycle involving phases of change in the areas of objectives, staffing, information, performance measurement, and interorganizational relations. Additional studies of the social response process are needed. The behavior of MNCs under internationally heterogeneous conditions of social expectations requires special attention.

3. International Environmental Management

a. Comparative environmental policy

The environmental literature has paid little attention to multinational studies of the political and administrative dimensions of environmental policy-making.[52] Comparative, cross-national studies could be useful in a number of areas, including: pressure group activity, environment ideologies, political party adaptation, planning approaches, institutional design, and regulatory methods.[53] Studies of the transnational diffusion of environmental policy innovations, such as the impact statement requirement, with a particular focus on the role of the MNC, could provide useful policy guidance for intergovernmental and international environmental organizations.

b. Global environment-energy interaction

The interplay between environment, energy, and the MNC needs to be explored on a global basis. Many multinational industries, especially petroleum, chemicals and

metals, are at the same time both pollution and energy intensive. Their growth in the past has been predicated on low-cost energy and environmental services. The subject of induced international shifts in location in response to energy and environment is only beginning to receive research attention.[54] More analysis of the tradeoffs between environmental policy requirements and the need for more production of energy on a global basis is also necessary if current policy choices are to be guided properly.

c. Limits to growth and the MNC

This study has only been concerned with the subject of redirecting the character of industrial growth; attention has not been given to the issue of stabilizing or stopping this growth. Realistic recognition needs to be given to the fact that an eco-catastrophe is possible if the present course of exponential global industrial growth continues.[55] The risks must be taken seriously and evaluated carefully, since prospects for the human future are at stake. Alternative conceptions of the role of the MNC in relation to the highly interdependent set of global problems--growth, population, food, technology, urbanization, environment, energy--need to be formulated and systematically explored.

As Alfred N. Whitehead has said: "Systems, scientific and philosophic, come and go. Each method of limited understanding is at length exhausted. In its prime

each system is a triumphant success; in its decay it is an obstructive nuisance."[56] The conventional "economizing" mode of planning is one of these decaying systems; it needs to be replaced by an "environmentalizing" mode. At stake, given the trends in the global problem areas identified above, is the achievement of a long-term sustainable relationship, in the broadest sense, between the multinational enterprise and the Earth.

FOOTNOTES

CHAPTER IX

[1]Declaration on the Human Environment, Report of the United Nations Conference on the Human Environment held at Stockholm, June 5-16, 1972, U.N. Doc. A/CONF. 48/14 (1972), pp. 2-7.

[2]Daniel Bell, The Coming of Post-Industrial Society: A Venture in Social Forecasting (London: Heinemann, 1974), Chapter 4.

[3]K. William Kapp, The Social Costs of Private Enterprise (New York: Schocken Books, 1971), p. xxi.

[4]For a similar view see: John G. Welles, "Multinationals Need New Environmental Strategies," Columbia Journal of World Business, 8 (Summer, 1973), pp. 11-18.

[5]For a discussion of this emerging new social contract see: Melvin Anshen, "The Socially Responsible Corporation: From Concept to Implementation," in Melvin Anshen, ed., Managing the Socially Responsible Corporation (New York: Macmillan, 1974), pp. 1-22.

[6]"New Environmental Guidelines Framed for Broad Application," Journal of Commerce, (July 25, 1974), pp. 1ff.

[7]For Chevron's experience see: "Impact Statement Makes Impact," Chemical Week (Nov. 13, 1974), pp. 40 & 44; for American Metal Climax see: "How Social Responsibility Became Institutionalized," Business Week (June 30, 1973), p. 78, and Jonijane Paxton, "An Experiment in Ecology--AMAX/Henderson: Meeting the Environmental Challenges," Editorial ALERT (July, 1974), pp. 1-32.

[8]For BASF's experience see: Oliver G. Wood, Jr., et. al., "The BASF Controversy: Employment vs. Environment," Essays in Economics, No. 25 (Nov., 1971) (Bureau of Business and Economic Research, College of Business Administration, The University of South Carolina); for Shell see: "A Debate Over Delaware's Tough Coastal Use Law," Business Week (March 2, 1974), pp. 71-73; for Akzo see: "Dutch Companies, Authorities Move Fast to Cut Pollution," European Chemical News (June 14, 1974), p. 30; for ESTEL see: "The Antipollution War Intensifies; Higher Costs Jeopardize Plans," Business Europe (Sept. 3, 1971), p. 288.

[9]For ESSO-BHP's experience see: "Conservationists Couldn't Stop This Pipeline," Chemical Week (Feb. 28, 1973), pp. 25-26; for Pfizer see: "Pfizer Strives to Win Friends and Influence Critics," International Management (Dec., 1973), pp. 41-43; for Bayer-BP see: "Europe Antes Up for Chemicals," Chemical Week (May 22, 1974), p. 45; for Aleyeska see: "Alaska: Closer to Cashing Oil's Riches," Business Week (March 25, 1972), pp. 78-83 and Richard Corrigan, "Alaska Embarks on its Biggest Boom as Pipeline Gets Under Way," Smithsonian, 5 (Oct., 1974), pp. 38-49.

[10]For U.S. Steel's experience see: "Big Steel Agrees to Clean Up," Business Week (Aug. 19, 1972), p. 25; for Union Carbide see: "A Corporate Polluter Learns the Hard Way," Business Week (Feb. 6, 1971), pp. 52-56; for August Thyssen Hütte see: "The Black Giant," Newsweek (May 7, 1973), p. 87; for Montedison see: "Will Italy Blow the Whistle on Pollution?" Chemical Week (May 31, 1972), p. 47.

[11]For Gulf Oil's experience see: "Dutch Demonstraters Put Pressure on Polluters," Chemical Week (Aug. 23, 1972), p. 35; for Rio Tinto Zinc see: "Showpiece Smelter Bites the Dust," Chemical Week (March 3, 1972), p. 43; for Reynolds Metals see: "Reynolds Metals vs. German Environmentalists: The Lessons to be Learned," Business Europe (Dec. 6, 1974), p. 385; for Dow Chemical see: Irvin Schwartz, "The High Cost of Pollution Control," Chemical Week (May 24, 1972), p. 63; for Reserve Mining see: "The Reserve Mining Company," Environment, 16 (June, 1974), p. 21.

[12]Richard N. L. Andrews sees environmental impact assessment as a new concept of planning analysis and having this objective. See: Richard N. L. Andrews, "A Philosophy of Environmental Impact Assessment," Journal of Soil and Water Conservation, 28 (Sept.-Oct., 1973), pp. 197-203.

[13]Application of the model to product policy is discussed below in the context of research implications.

[14]See the following for an excellent analytic framework for this problem: C. W. Churchman and A. H. Schainblatt, "The Researcher and the Manager: A Dialectic of Implementation," Management Science, 11 (Feb., 1965), pp. 69-87.

[15]For a discussion of this legitimacy aspect see: Richard Warren Smith, "A Theoretical Basis for Participatory Planning," Policy Sciences, 4 (Sept., 1973), pp. 275-295.

[16]For applications of systems thinking to planning see: Russell L. Ackoff, "The Systems Revolution," Long Range Planning, 7 (Dec., 1974), pp. 2-20 and Hasan Ozbekhan, "The Emerging Methodology of Planning," Fields Within Fields, No. 10 (Winter, 1973-74), pp. 63-80.

[17]See: Richard N. L. Andrews, "A Philosophy of Environmental Impact Assessment," p. 200.

[18]This list has been compiled from survey literature in the fields of impact assessment and futures research. See: Richard N. L. Andrews, "Approaches to Impact Assessment: Comparison and Critique," (presented at the Short Courses on Impact Assessment in Water Resources Planning: Amherst, Mass., Ann Arbor, Mich., and Eastsound, Wash., May and June 1973); Kan Chen and George J. Zissis, "Philosophical and Methodological Approaches to Technology Assessment," (Environmental Research Institute of Michigan, The University of Michigan, June 1973); Thomas G. Dickert, "Methods for Environmental Impact Assessment: A Comparison," in Thomas G. Dickert with Katherine R. Domeny, eds., Environmental Impact Assessment: Guidelines and Commentary (Berkeley: University Extension, University of California, 1974), pp. 127-143; and François Hetman, Society and the Assessment of Technology (Paris: Organization for Economic Cooperation and Development, 1973).

[19]For one model which views impact assessment in this way see: Leonard Ortolano, "Impact Assessment in the Water Resources Planning Process," (presented at the Short Courses on Impact Assessment in Water Resources Planning: Amherst, Mass., Ann Arbor, Mich., and Eastsound, Wash., May and June, 1973).

[20]This is inferred by analogy from an examination of the response of U.S. federal agencies to the specific "action-forcing" provisions in N.E.P.A.

[21]For a similar view see: Robert W. Ackerman, "How Companies Respond to Social Demands," Harvard Business Review, 51 (July-Aug., 1973), pp. 88-98.

[22]See: Yair Aharoni, The Foreign Investment Decision Process (Boston: Division of Research, Graduate School of Business Administration, Harvard University, 1966) and Joseph L. Bower, Managing the Resource Allocation Process: A Study of Corporate Planning and Investment (Boston: Division of Research, Graduate School of Business Administration, Harvard University, 1970).

[23]Walter F. Buckley, Sociology and Modern Systems Theory (Englewood Cliffs, N. J.: Prentice Hall, 1967), pp. 206-207.

[24]R. W. White, Ego and Reality in Psychoanalytic Theory (1963), p. 188, quoted in Richard Warren Smith, "A Theoretical Basis for Participatory Planning," p. 289.

[25]See: Ronald Coase, "The Problem of Social Cost," Journal of Law and Economics, 3 (Oct., 1960), pp. 1-44; E. J. Mishan, "The Postwar Literature on Externalities: An Interpretative Essay," Journal of Economic Literature, 9 (March, 1971), pp. 1-28; and Ralph Turvey, "On Divergences Between Social Cost and Private Cost," Economica, 30 (Aug., 1963), pp. 309-313.

[26]See: Barry M. Mitnick and Charles Weiss, Jr., "The Siting Impasse and a Rational Choice Model of Regulatory Behavior: An Agency for Power Plant Siting," Journal of Environmental Economics and Management, 1 (Aug., 1974), pp. 150-171.

[27]See: Stuart S. Nagel, "Incentives for Compliance with Environmental Law," American Behavioral Scientist, 17 (May-June, 1974), pp. 690-710.

[28]For a survey of these techniques see: J. Pen, "Seven Methods of Anti-pollution Policy: An Essay in Taxonomy," Amsterdam-Rotterdam Bank N.V. Economic Quarterly Review, No. 24 (March, 1971), pp. 5-12.

[29]For a collection of articles expressing this theme see: Donald M. McAllister, ed., Environment: A New Focus for Land-Use Planning (Washington, D. C.: RANN-Research Applied to National Needs, National Science Foundation, Oct., 1973).

[30]For a discussion of physical planning in Sweden, for example, see: Lennart J. Lundqvist, "Sweden's National Physical Planning for Natural Resources Management," Environmental Affairs, 2 (Winter, 1972), pp. 487-504.

[31]See: "The Threatened Coastlines," Time (Aug. 30, 1971), pp. 32-33 and "Outlook: Group Considers Proper Management of Coastal Areas," Environmental Science and Technology, 8 (July, 1974), pp. 606-607.

[32]"Ten Recommendations of O.E.C.D.'s Environment Ministers," The O.E.C.D. Observer, No. 72 (Oct.-Nov., 1974), pp. 9-11.

[33]Ibid., p. 11.

[34]The weaknesses in either the process or statements prepared so far have been discussed in: Thomas G. Dickert and Jens C. Sorenson, "Some Suggestions on the Content and Organization of Environmental Impact Statements," in Thomas G. Dickert with Katherine Domeny, eds., Environmental Impact Assessment, pp. 35-53; Peter M. Hoffman, "Evolving Judicial Standards Under the National Environmental Policy Act and the Challenge of the Alaska Pipeline," in H. Floyd Sherrod, ed., Environment Law Review - 1973 (New York: Clark Boardman, 1973), pp. 287-334; and Water Resources Research Institute, How Effective are Environmental Impact Statements? (papers from a seminar conducted by Water Resources Research Institute, Oregon State University, Spring Quarter 1973), (Springfield, Va.: National Technical Information Service, Report No. PB-230 702, July 1973).

[35]Roger C. Cramton and Richard K. Berg, "On Leading a Horse to Water: N.E.P.A. and the Federal Bureaucracy," Michigan Law Review, 71 (Jan., 1973), pp. 511-536.

[36]For additional benefits see: Richard Warren Smith, "A Theoretical Basis for Participatory Planning."

[37]These and other proposals are discussed in Barry M. Mitnick and Charles Weiss, Jr., "The Siting Impasse," (especially see the list of references on broadened public participation, pp. 169-171).

[38]As viewed by Richard N. L. Andrews: "Industries and government agencies both have painted the issue as one of efficiency versus participation, but the issues themselves are over substance. At one extreme, industries obviously can plan most efficiently if they are under zero pressure from any external goal structure; and at the other extreme, public pressure could be handled quite efficiently if the industries were willing to capitulate immediately to public demands. A more fundamental issue, therefore, is the need for further innovation, to enable equitable and legitimate outcomes to be achieved more efficiently; and this issue need not necessarily be a function of prolonged public delay and expense insofar as industry is unwilling to adapt to new needs, circumstances, and views of social acceptability." (Personal correspondence from Richard N. L. Andrews to Thomas N. Gladwin, March 14, 1975.)

[39]Joseph L. Sax, Defending the Environment: A Handbook for Citizen Action (New York: Vintage Books, 1970), p. 100.

[40] Ibid. (See Chapters 4 through 7 especially).

[41] For an analysis of this type of legislation see: "Comment, Standing on the Side of the Environment: A Statutory Prescription for Citizen Participation," Ecology Law Quarterly, 1 (Summer, 1971), pp. 561-652.

[42] For a wide ranging view of these shortcomings see: Roger C. Cramton and Barry B. Boyer, "Citizen Suits in the Environmental Field: Peril or Promise?" Ecology Law Quarterly, 2 (Summer, 1972), pp. 407-429.

[43] Lynton K. Caldwell, "Organizational and Administrative Aspects of Environmental Problems at the Local, National and International Levels," p. 19, in U. N. Department of Economic and Social Affairs, Organization and Administration of Environmental Programmes (New York: United Nations, ST/ESA/16, 1974).

[44] Ibid., p. 26.

[45] See: Richard A. Posner, "Theories of Economic Regulation," Bell Journal of Economics and Management Science, 5 (Autumn 1974), pp. 335-358.

[46] For a full listing of criticisms see: Barry M. Mitnick and Charles Weiss, Jr., "The Siting Impasse," pp. 151-154.

[47] The "team concept" approach was utilized in the joint planning of Weyerhaeuser's Longview, Washington facility with great success. See: "How Social Responsibility Became Institutionalized," Business Week (June 30, 1973), p. 78.

[48] One especially useful contribution has been made by Richard Warren Smith, "A Theoretical Basis for Participatory Planning."

[49] See: "Dow's Big Push for Product Safety," Business Week (April 21, 1973), pp. 82-85; "Moving Toward Control of Toxic Chemicals," Business Week (May 11, 1974), pp. 112-114; and John Rivoire and John M. Winton, "Energy and the Product Mix," Chemical Week (Nov. 11, 1974), pp. 29-32.

[50] For a research proposal on this topic see: Thomas Neil Gladwin, "The Causes, Course, and Consequences of Environmental Conflict: A Cross-National Study of Intergroup Conflict Over the Environmental Impact of New Industrial Development," (Geneva, Switzerland: Centre d'études industrielles, Jan., 1975).

[51]For an extremely valuable start in this area see: Robert W. Ackerman, "How Companies Respond to Social Demands."

[52]Some interesting work is beginning to emerge. See for example: Lennart J. Lundqvist, "Do Political Structures Matter in Environmental Politics? The Case of Air Pollution Control in Canada, Sweden and the United States," American Behavioral Scientist, 17 (May-June, 1974), pp. 731-750.

[53]See the Council for European Studies proposal entitled "Program of Comparative Studies of Environment and Society" for an interesting collection of proposed research topics in this area. See: "Comparative Environmental Policy," European Studies Newsletter, 11 (Oct., 1972), pp. 9-12.

[54]See: Thomas N. Gladwin and John G. Welles, "Environmental Policy and Multinational Corporate Strategy" (paper presented at the Ford Foundation Symposium on the International Economic Dimensions of Environmental Management, New York: New York University, April 17, 1975).

[55]See: Barbara Ward and René Dubos, Only One Earth: The Care and Maintenance of a Small Planet (New York: W. W. Norton, 1972) and Donella H. Meadows, et al., The Limits to Growth (New York: Universe Books for Potomac Associates, 1972).

[56]Alfred N. Whitehead, Adventures in Ideas (New York: Macmillan, 1933), pp. 203-204.

APPENDIX A

INTERVIEW GUIDE EMPLOYED IN FIELDWORK

A. INTRODUCTION

1. Explain research project
2. Provide my background
3. Explain confidentiality policy
4. Present overview of topics to be covered
5. Explore nature of respondent's position

B. CORPORATE ORGANIZATION AND POLICY FOR ENVIRONMENTAL MANAGEMENT

1. Organizational Arrangements

   a. Is there a corporate level EC officer and staff department? (When established? What duties? Reports to? Composition? Geographic responsibility?)
   b. Is there a corporate level top management EC committee? (When established? Who serves on it? Responsibilities?)
   c. Are there corporate level EC officers in the Research, Public Relations, Engineering, and Legal Departments?
   d. Are there EC officers at the regional, divisional, operating and plant levels? (domestic and international?)

2. Objectives:

   a. Has the company created a written formal statement of environmental policy? (Applied globally or domestically? What does the policy say? When was it established? How were they established?)
   b. Does top management frequently illustrate its support for the policy? (How is this done?)

3. Research and Technology:

   a. Does the company sell EC technology and services externally? (What is sold? When did this begin? Current sales volume?)

b. Has the company self-developed new EC technologies? (What kind? Where in the company is this activity done?)
c. What kind of EC-related research is the company engaged in? (Basic? Product impact? Participation in joint-industry research programs? Which ones?)

4. External Surveillance and Interaction:

a. Does the company maintain close contact with governmental EC agencies? (Direct or indirect? At what governmental levels? Who maintains contact? What issues or matters are the contacts concerned with? How often?)
b. Does the company monitor the activities of, or engage in direct liaison with, conservation groups? (In what manner? How often? For what reasons?)
c. Has staff been assigned to monitor EC laws, legislation, technology and events? (How is this done? Where is this done? Why is it done?) (Domestic and international?)
d. Is the company involved in inter-industry and government-industry groups on EC matters? (Which ones? Nature of involvement?)
e. Does the company produce and distribute an internal trend letter, bulletin or bibliography on EC matters? (Who produces it? Who receives it?)

5. Performance Measurement:

a. Is plant level EC performance reported to a headquarter's level unit? (How often? On what matters? Why is it done?) (Domestic and international?)
b. Are plant managers measured and evaluated on criteria of EC performance? (How is this done?) (Domestic and international?)

6. Prior Conflict Experience

a. Has the company experienced any delays or terminations in previous projects for environmental reasons? (How serious? Where did they happen?)
b. Has the company been required to close down any existing plants for environmental reasons? (When did these occur? Where did they occur?)
c. Has the company experienced any unfavorable publicity for environmental reasons? (Concerning what? When did this happen? How serious was it?)

d. Has the company been involved in any environmental litigation during the last five years? (Where? With whom? Over what? Outcomes of?)

C. PROJECT PLANNING EXPERIENCE

1. Nature of the Project:

a. Economic characteristics of project? (Total cost? Scale? Percent of ownership? Who are the partners?)
b. Technical characteristics of project? (Capacity? Products it will product? Type of process technology? Residuals discharges?)
c. Site location characteristics? (An expansion? In an industrial zone? Is there neighboring industry? Is it in virgin territory?)
d. Timing of project? (When first proposed? When did intensive planning begin? When did construction begin? When did plant go "on-stream"?)

2. Public Reaction to Project:

a. Were public hearings required? (When did they occur? What happened?)
b. Was an environmental impact statement or baseline survey required? (By whom?)
c. Were planning permissions and discharge approvals required? (From whom? How stringent were the governmental demands for EC?)
d. When did the local citizenry first find out about the project? (What was the community's reaction? Did any groups form to oppose the project? How was the project treated in the local press?)
e. Had there been previous cases of opposition to other projects in the same locality?

3. Planning of the Project:

a. Were environmental professionals involved in the planning of the project? (How were they involved? Were they in-house or external? What disciplines were represented? Were the consultants locally-based? When were they brought in? Did the engineering and construction contractor provide any environmental skills?
b. Was a prestartup ecological baseline survey conducted? (What was surveyed? When was it done? Who did it? How was it done?)

c. Was an environmental impact assessment performed? (What was included? Who did it? Was an impact statement produced? When was it performed?)
d. Were plans made for residuals discharge monitoring and environmental media monitoring? (What scope? How regular? To be done by whom?)
e. Was a section outlining the environmental aspects of the project included in the project proposal? In the capital appropriations request form? (Contents of?)
f. Was the project reviewed and approved by top management on environmental grounds separately from the normal review procedure? (When did it occur? What did it involve?)
g. Was the project reviewed and approved by the corporate environmental staff office? (When did it occur? What did it involve?)
h. How was the site location selected? (Site survey undertaken? When selected? By whom? How many alternative sites were considered? Were environmental impact criteria employed? How so?)
i. How was the central process technology selected? (When selected? Who was involved in selection? Alternatives considered? What bearing did environmental factors have on the selection?)
j. How were the construction methods selected? (Was this left to the contractor? Were environmental safeguards built into the construction plan?)
k. Was a survey of local community environmental values and perceptions conducted?
l. Did the company seek community and citizen group input? (How was this done? When did this occur? What was learned from it?)
m. Did the company initiate a community information program or engage in any special technical education efforts? (Who for? What did this consist of?)

4. Previous Similar Planning Experience:

a. Had a project similar to this one been planned by the company recently? (Where for? Were environmental professionals involved? Were environmental investigations conducted? How did the local community react to the project?)
b. Does the company have similar plants already in operation? (Where? Are residuals monitored at these plants? Are environmental impacts monitored? Has the company been engaged in EC modernization efforts at these plants?

c. When was the central process technology of the current project first designed? (Has it been modified through the years for better EC performance?)

APPENDIX B

ADVANCE LETTER SEEKING COOPERATION IN THE STUDY

(On letterhead stationery of Graduate School of Business Administration, The University of Michigan or Centre d'Etudes Industrielles)

April ___, 1974

(Address of Contact or
Environmental Coordinator)

Dear _____:

The purpose of this letter is to ask your firm's participation in my doctoral dissertation research project into the role of ecological factors in new foreign investment project planning. The project is sponsored jointly by The Graduate School of Business, The University of Michigan and The Center for Education in International Management (C.E.I.) in Geneva, Switzerland. It is part of an ongoing joint C.E.I.-M.I.T. project entitled "Professional Education for Environmental Management," and is supported by a two-year National Scholarship in Industrial Ecology awarded in competition from the Tenneco Foundation.

The goal of the research is to construct an environmental evaluation system for use in multinational corporate facility planning. To insure a close correspondence between the planning system and the real needs of industry, it is essential to first examine the practices and problems currently associated with this new and complex planning issue.

The study is being conducted among U.S.-, Canadian-, and European-based multinational firms in the petroleum, chemical and metal industries. Some interviews have already been conducted and the cooperation of various European firms has already been obtained. Confidentiality is assured to all respondent firms. No companies will be

Appendix B--continued

mentioned by name in the final report and all names, places, dates, etc. will be disguised to prevent attribution. The research is under the supervision of a committee of University professors, chaired by Dr. Vern Terpstra, Professor of International Business at Michigan.

The study is being conducted by means of personal interviews with environmental, international, and project management executives in each firm. The interviews will be held at your offices, at your convenience, and will require about an hour each. Fuller information on the content of, and desired respondents for, the interviews appears in the attached memorandum.

This study should be of value to your corporation in producing environmental evaluation guidelines for use in new project planning. For your participation you will receive a comprehensive summary of the findings and recommendations. May I suggest that a day during the week of _____ would be ideal, as I plan to be in the _____ area at that time. Could your please inform me of your participation decision by letter or phone call to the address on the memorandum.

Sincerely yours,

Thomas Neil Gladwin,
Ph.D. Candidate

Enclosure

Appendix B--continued

Thomas Neil Gladwin, Ph.D. Candidate
Institute for International Commerce
Graduate School of Business
Administration
The University of Michigan
Ann Arbor, Michigan 48104
Tel. (313) 763-1387

MEMORANDUM: INTERVIEW TOPICS AND DESIRED RESPONDENTS

The interview topics and desired respondents fall into three categories:

A. OVERALL CORPORATE ENVIRONMENTAL MANAGEMENT POLICY

This topic ideally requires an executive, such as an environmental vice president, director or coordinator, who is familiar with company objectives, policies, organization, experience, and information networks in the environmental management area.

B. ENVIRONMENTAL MANAGEMENT AND INTERNATIONAL OPERATIONS

This topic ideally requires an executive, having broad international responsibilities, who is familiar with the company's international involvement, nature of the foreign investment planning process, and the general impact of public and governmental environmental protection action on company operations around the world.

C. ROLE OF ENVIRONMENTAL FACTORS IN A RECENT OR CURRENT PROJECT

This topic ideally requires an executive, such as a project manager, who has been intimately involved with a recent investment project, domestic or foreign (say one now close to, already in, or just out of the construction stage), and who can reconstruct the history of the project's planning process with regard to environmental dimensions.

NOTE ON INTERVIEW ARRANGEMENTS

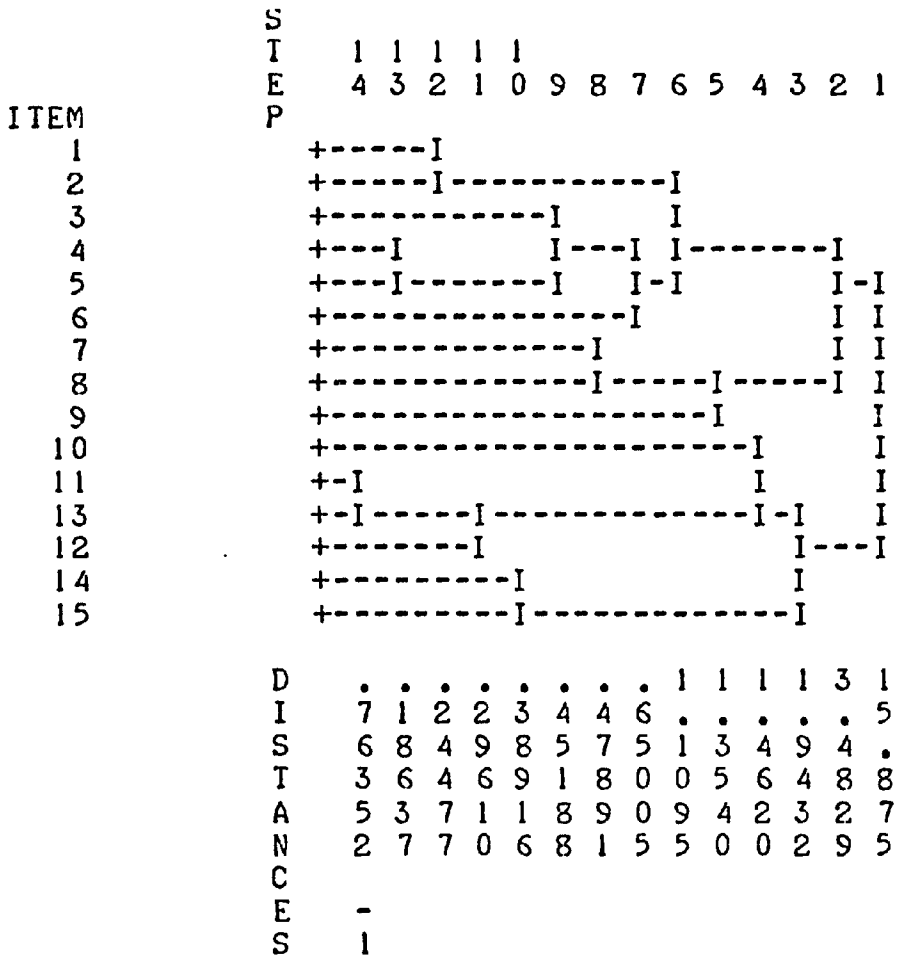
I would like to rely on your judgment with regard to the selection of executives most appropriate to discuss the three topics above. A minimum of 2 or 3 interviews is felt to be necessary. I would, of course, be very interested in talking with other executives (from governmental affairs, corporate planning, engineering, law, etc.) who could provide relevant inputs on the interview topics.

Appendix B--continued Memorandum

If possible, I would like to conduct all of the interviews on the same day, and in the same corporate location. If this is not possible, I am willing to spread the interviews over a two-day period and/or to travel to other locations (in the U.S. and Europe) in order to complete the interviews.

APPENDIX C

OUTPUT OF ECOLOGICAL INCORPORATION CLUSTER ANALYSIS[a)]



[a)] Performed casewise on equally weighted dimensions, with fifteen cases, using a minimum variance hierarchical clustering algorithm, and euclidiean distance coefficient. Item numbers correspond to projects as shown below:

1. Polyethylene Plant
2. Aluminum Smelter Expansion
3. Ferrosilicon Smelter
4. Oxygen Steel Plant Expansion
5. Polypropylene Plant
6. Hydrofluoric Acids Plant
7. Aluminum Smelter
8. Alumina Extraction Plant
9. LNG Import Terminal
10. Steelworks Modernization
11. Ore Mining Development
12. Offshore Oil Complex
13. Natural Gas Pipeline System
14. Petrochemical Complex
15. Petroleum Refinery

APPENDIX D

A TWELVE NATION SURVEY OF ENVIRONMENTAL POLICY

A. INTRODUCTION

The environmental policy system of any one nation is viewed in this study as the package of interrelated actions taken by organized publics in an attempt to solve or prevent environmental problems in that nation. The policy system typically involves the creation of institutional arrangements designed to place constraints, pressures, or demands on citizen and industry behavior. Three dimensions of national environmental policy systems are examined in this appendix: 1) the extent of governmental intervention in the environmental protection area; 2) the amount of public attention to, and political salience of, issues of environmental protection; and 3) the duration of both governmental intervention efforts and public attention. These three dimensions are examined for each of the twelve nations which entered into this study by virtue of being either a home country of one of the surveyed MNCs and/or a host country of one of the MNC projects. From this examination the nations are crudely rank ordered according to their position on an "environmental protection issue-attention cycle."[1] This

identification of leading and lagging countries provides us with the information necessary to test the two hypotheses of home country and host country environmental policy influence in Chapter VII.

Little if any systematic research on comparative environmental policy has yet been done. The twelve nation environmental policy survey presented below was partly derived from reference sources which have attempted to catalog the programs of various nations.[2] To a greater extent, however, it was derived from reports documenting the environmental protection policies, programs, and progress in the individual nations: United States,[3] Sweden,[4] Netherlands,[5] West Germany,[6] United Kingdom,[7] Australia,[8] Canada,[9] France,[10] Italy,[11] Ireland,[12] Iceland,[13] and Mexico.[14]

B. GOVERNMENTAL INTERVENTION IN ENVIRONMENTAL PROTECTION

Four indicators are employed in an attempt to measure the relative extent of intervention by governments into the field of environmental protection. Two relate to organization and the other two, to administrative machinery.

1. National Environmental Protection Ministry, Department or Agency

Table D.1 shows that only four of the twelve nations were found to have national ministries, departments or agencies concerned with the relatively comprehensive

TABLE D.1

GOVERNMENTAL ENVIRONMENTAL PROTECTION ORGANIZATION AND MACHINERY

Country	Country Has Natl. Ministry, Dept., or Agency Concerned w/ Relatively Comprehensive Formulation, Administration, and Enforcement of Environmental Policy (0 = no; .5 = partly; 1 = yes)	Country Has Regional, Provincial or State Level Organizations for Environmental Protection (0 = no; .5 = partly; 1 = yes)	Country Has a Relatively Comprehensive Package of Environmental Protection Legislation (Air, Water, Solid Waste, Noise, Land Use) (0 = no; .5 = partly; 1 = yes)	Extent to Which Country has Planning Controls (EC Related over New Industrial Development (0=little; .5= some; 1 = extensive)
Mexico	.5	0	0	.5
Iceland	0	0	.5	.5
Ireland	0	.5	0	1
Italy	.5	.5	0	.5
France	.5	.5	.5	.5
Canada	1	1	.5	.5
Australia	.5	1	.5	1
United Kingdom	1	1	.5	1
West Germany	.5	1	.5	1
Netherlands	.5	1	1	1
Sweden	1	1	1	1
United States	1	1	1	1

formulation, administration, and enforcement of environmental policy. These were the United Kingdom with its Department of the Environment and Alkali Inspectorate, Sweden with its National Environment Protection Board and Franchise Board for Protection of the Environment, Canada with its Department of the Environment, and the United States with its Environmental Protection Agency and Council on Environmental Quality. The administrative structures for environmental policy-making were judged to be less fragmented in these four nations in comparison to the others. Six nations were found to have national level organizational units that either dealt less comprehensively with issues of environmental protection or only exercised a few administrative functions. France's Ministry for Protection of Nature and Environment, Australia's Department of the Environment and Conservation, and the Netherland's Ministry of Public Health and Environmental Hygiene all were serving primarily coordinating roles. Italy, Germany, and Mexico had no separate environmental ministries as such, but had added some protection functions to existing agencies: a Central Board for Air Pollution Control was attached to the Ministry of Health in Italy, air and water pollution control sections were added to German's Department of the Interior, and an undersecretary for environmental improvement had been placed in Mexico's Ministry of Health. Two nations, Iceland and

Ireland, were found to have no national level governmental units concerned primarily with environmental protection.

2. Regional, Provincial or State Level Environmental Protection Organizations

Separate departments or authorities dealing with environmental protection on a regional, provincial, or state-level basis, as shown in Table D.1, were found in seven nations: Canada, the United Kingdom, Australia, the Netherlands, Sweden, West Germany, and the United States. Considerable jurisdictional power over environmental issues was found at the state or province level in the federal systems of Canada, the United States, West Germany, and Australia. In each of these four, however, a trend toward increasing central government jurisdiction was present. Jurisdictional conflict has plagued the environmental programs of these four nations, as well as those in Italy. In the Netherlands, the United Kingdom, and Sweden the provincial and municipal EC organizations work closely with the national level ministries. The Dienst Centraal Milieubeheer Rijnmond (DCMR) which advises the supramunicipal Rijnmond Public Authority in the Netherlands on environmental matters has achieved world acclaim for its sophisticated approach to environmental management.[15] Each county administration in Sweden has a nature conservancy section.

Environmental protection functions have been added to some existing county and municipal governmental bodies

in Italy, France, and Ireland. Local magistrates were found to be initiating legal actions on corporate polluters in Italy based on various fishing, hygiene, and sanitation laws. France, with its unitary system of government and prefectural jurisdiction, gives the local prefect considerable environmental protection authorization powers. Ireland's county and city councils handle issues of environmental protection under their local planning and development authority. Regional or local EC organizations have not been established in Mexico or Iceland.

3. Comprehensive National Environmental Protection Legislation

As shown by the scores in Table D.1, only three nations were judged to have packages of modern environmental protection legislation dealing in a relatively comprehensive fashion with most of these problems: air, water, solid waste, noise, toxic chemicals, and land use. The breadth of legislation bearing upon these problems was found to be about the same in Sweden, the Netherlands, and the United States; the separate pieces of legislation, however, at least in the U.S., are occasionally inconsistent and conflicting. Sweden's Environment Protection Act of 1969 has been hailed as perhaps the world's most comprehensive package of legislation in the environmental field.[16] The legislation in France, Canada, Iceland, the United Kingdom, Australia, and West Germany was found to be relatively less

comprehensive, although movements to either modernize, consolidate, and/or fill in the gaps in the legislation were evident in each nation. With regard to France, one observer concluded: "Existing regulation does not yet answer the needs of a comprehensive anti-pollution policy."[17] An observer of the United Kingdom notes:

> The variety and extent of environmental protection available under current English statutes seems impressive. But the appearance belies the reality. The statutory protection in no way represents a determined or even coherent attempt to tackle the problem of pollution: in many statutes there are glowing omissions or procedural difficulties.[18]

This is explained by another observer as a function of the British approach to pollution control:

> The basis of pollution control in the United Kingdom is an emphasis on cooperation rather than coercion, on negotiation rather than legislation, and on a system of consent rather than one of rigid controls.[19]

The "Control of Pollution Bill" (under discussion in Parliament as of late 1974), however, seeks to create a very detailed framework law which will reorganize and block the holes in existing legislation.

Compared to the other nations, the environmental protection legislation was found to be very incomplete in Italy, Ireland, and Mexico. CONFINDUSTRIA, the General Conference of Italian Industry, found Italy's environmental laws and regulations to be outdated, full of gaps and often in contradiction with one another.[20] Italy has no national water pollution control legislation, although a projected

framework law has been under discussion for the last six years. One observer of environmental law in Ireland has written:

> Ireland's legislators have shown surprisingly little interest in protecting amenity and the country's undisputed natural beauty. . . . What little legislation there is directly relating to pollution is diffuse rather than coherent. . . . It emerges from the above that Ireland's anti-pollution policies could be described in modern terms as inadequate, ill-coordinated and distinctly outmoded.[21]

Mexico has only one federal environmental law related to solid particulates of smoke and dust.

4. Planning Controls Over New Industrial Development

Table D.1 shows that all nations were found to be exerting some degree of environment-related planning control over new industrial development. The extent to which controls such as environmental impact statements, public hearings, licensing procedures, discharge permits, emissions certificates, and agency permissions are employed, however, differs from nation to nation. The extent of controls was deemed to be fairly extensive in the seven nations of Ireland, the United Kingdom, Australia, the Netherlands, Sweden, West Germany, and the United States. The controls employed in the United States can at times be extremely elaborate. On recent refinery expansion project by Chevron at Perth Amboy, New Jersey required twenty-seven approvals from fourteen federal, state, county, and city agencies.[22]

Environmental impact statements are required for private projects when either a federal permit, authorization or participation is involved.

The only other nation extensively employing the environmental impact statement procedure in 1974 was Australia. As of January 1, 1974, federal environmental impact statements became mandatory for all development projects within Australia which will have significant environmental consequences, and in which commonwealth funds and commonwealth constitutional powers are involved.[23] Prior impact statements are also required at the state level in Australia. In New South Wales the environmental impact assessment study must include:

1) a statement of the proposed project's major objective;
2) an analysis of the technological possibilities of achieving this objective;
3) a statement outlining the environment's characteristics and conditions prior to the project's implementation;
4) a report on alternate feasible plans for achieving the objective;
5) a separate report on each alternative engineering plan considered practical;
6) an assessment of each plan's probable impact on the existing environment; and
7) a summary or recommendation including the rationale behind any particular plan.[24]

In the United Kingdom, a certificate of registration for a new facility must be received from the Alkali Inspectorate confirming use of the "best practicalbe means" of air pollution control. Prior approval, usually involving a public inquiry, must also be attained from the local

authorities. In Sweden a license or concession for new industrial plants must be obtained from the National Franchise Board for Protection of the Environment. West Germany, through its 1974 Clean Air and Noise Abatement Act, adopted a rigorous program of licensing control, governmental inspections, and mechanisms for public viewpoint expression. Prior licenses are required in Holland under the Nuisance Act and Air Pollution Act. Local planning authorities are empowered in Ireland under the Local Government (Planning and Development) Act of 1963 to impose environmental conditions when granting permission for new developments. One observer notes, however, that local authorities have sometimes been reluctant to employ the Act for such purposes, for three distinct reasons:

> The first of these is essentially political; local interests mulitate against the imposition of conditions that might be so stringent as to divert a potential industrial development elsewhere (and with it a source of employment). Secondly, planning authorities may lack both the experience and the expertise to establish viable effluent and emission criteria; the Act itself makes no attempt to postulate conditions and offers the authorities no criteria or technical guidance. Thirdly, local authorities are put in an invidious position by the fact that this Act does not apply to existing developments, with the result that criteria and limits imposed on a new development could well be completely at variance with conditions tolerated in existing developments manufacturing the same product or using the same processes.[25]

The problems inherent in local planning control, as noted above for Ireland, are found in all nations. The

planning controls employed in Italy, Iceland, Mexico, Canada, and France may especially suffer from such problems. In Italy, planning permissions are handled on a local basis by the municipalities, many of which are anxious to become industrialized. Mexico, Iceland, and the relatively less developed provinces of Canada are in similar situations. In France a local prefect must grant an authorizing arrêté, which sets forth the environmental rules and conditions with which the plant must thereafter comply. These standards are rigorously enforced in nationalized industries and utilities, but generally less so for private firms.[26]

C. PUBLIC ATTENTION TO, AND POLITICAL SALIENCE OF, ENVIRONMENTAL PROTECTION

Four indicators are utilized in an attempt to crudely measure the relative amount of public attention to, and political salience of, environmental protection in each of the twelve nations. Two relate to interest group activity and the other two, to policial attention.

1. Citizen Environmental Group Strength and Activism

As shown in Table D.2, citizen environmental group strength and activism was judged to be relatively high in six nations: Australia, the United Kingdom, West Germany, the Netherlands, Sweden, and the United States.[27] The United States probably has the largest number of citizen environmental groups, in both absolute and per capita terms.

TABLE D.2

PUBLIC, INTEREST GROUP, AND MEDIA ATTENTION AND CONCERN

Country	Relative Citizen Environmental Group Strength and Activism (0 = low; .5 = medium; 1 = high)	Relative Amount of Citizen-Industry Environmental Conflict (0 = low; .5 = medium; 1 = high)	Relative Extent of News Media Attention and Influence (0 = low; .5 = medium; 1 = high)	Environmental Protection Was a Major National Political Issue (0=no; .5=partly; 1=yes)
Mexico	0	0	0	0
Iceland	0	0	.5	0
Ireland	.5	0	.5	0
Italy	.5	.5	.5	0
France	.5	0	.5	.5
Canada	.5	.5	1	.5
Australia	1	1	.5	1
United Kingdom	1	.5	.5	.5
West Germany	1	1	1	1
Netherlands	1	1	1	1
Sweden	1	0	1	1
United States	1	1	1	1

> More than 3,000 organizations in the United States are concerned with some aspect of the environment. The majority of these--about 2,500--exist on the local level and seldom assume national visibility or importance. National environmental policy is most often affected by the 250 national and regional organizations and the 400 state environmental groups with the membership, resources, and status to fight major political battles.[28]

The most politically militant and agressive groups are probably the Sierra Club, Friends of the Earth, and The Environmental Defense Fund which, among other activities, specialize in environmental litigation.

Citizen environmental groups are active and well-organized in Germany, especially in the three regions of the Rhein, Ruhr, and Elbe River valleys. In the United Kingdom the number of organizations concerned with the protection and conservation of the urban and natural environment is in the hundreds. The nationwide Nature Conservancy in Sweden has wide and active membership. The Netherlands has numerous groups, mostly ad hoc, which have emerged to vigorously oppose existing pollution and new industrial development. In Australia, the many and vocal citizen's groups have been joined by some of the construction unions. The Builders Labourers' Federation in New South Wales has over the past few years placed a series of "green bans" on demolition and construction work it considered environmentally harmful. At the middle of 1974,

projects worth about (AUS) $193,000 million were being held up by green bans.[29]

The citizen environmental groups in France, Canada, Ireland, and Italy were judged from the available literature to be either less numerous or less active. However, the French ecology movement was apparently given new impetus with the 1974 presidential campaign of the ecological candidate Professor René Dumont. A movement toward national coordination via the "Centre de Coordination pour un Mouvement Ecologique" is apparently now under way.[30] Much of Canada's environmental group activity is centralized in the provinces of Ontario and British Columbia and/or is focused mainly on large-scale controversial projects such as the James Bay hydroelectric power project and proposed McKenzie Valley pipeline. Ireland's conservation movement led by Antaisce has only recently become very active. Environmentalist pressure in Italy has been sporadic and has been centered largely in Venice and Milan. Italia Nostra, the major conservation group in Italy, pushed hard for the recent "Save Venice" bill and showed its influence a few years ago when they blocked plans for an expansion of Shell's refinery (note: now owned by ENI) near Milan and forced Gulf to shift the location of its planned Milan refinery to Bertonico, about forty miles away.[31] Environmental citizen group activity has been relatively nonexistent in the countries of Mexico and Iceland.

One interesting indicator of the role of citizen group activity in various nations is the multinational expansion of the U.S.-established group, the Friends of the Earth. This group has overseas offices in Australia, Ireland, South Africa, Yugoslavia, Holland, Germany, Sweden, France, and England. Friends of the Earth, Ltd., in London was fighting ten campaigns as of mid-1974: paper salvage, packaging, endandered species, whales, offshore oil, nuclear power, national parks, transport, insulation, and land use.[32]

2. Citizen-Industry Environmental Conflict

The amount of citizen-industry environmental conflict in a nation, relative to its overall level of industrial activity, was judged to be high in the United States, Australia, the Netherlands, and West Germany. Citizen-industry environmental conflict was measured by the number of citizen campaigns, demonstrations, and lawsuits against industrial firms on environmental grounds, and the number of delayed or terminated industrial projects as a result of citizen environmental opposition. A survey of the North American, Western European and Australian business and environmental literature for the period 1970-1974 revealed over 200 reported instances of such conflict, some of which are presented below. Of all the nations included in this study, the Netherlands was found to have the highest per

capita conflict rate. No other country has witnessed such a fierce and sustained attack on polluting industry. As of early 1973 it was estimated that some $1 billion in industrial investments had been turned away in order to protect the environment.[33] Considerable anti-development thinking has also been evident in the other three high conflict nations of Australia, West Germany, and the United States. The fact that these four nations are characterized by relatively high incomes is probably one explanatory factor.

Less per capita conflict was evident in Canada, the United Kingdom and Italy, and was generally more sporadic in nature. Little, if any conflict was reported in the countries of Sweden, France, Ireland, Mexico, and Iceland. The low per capita incomes, strong development orientation, and low absolute number of new industrial projects probably explain this for Mexico, Iceland, and Ireland. The rather consensual, unitary political systems and generous governmental incentives for anti-pollution investments in Sweden and France perhaps account for the small amount of reported conflict in these two nations.

To provide the reader with a brief overview of the kinds of citizen-industry environmental conflicts which have flared up around the world during the past few years, forty instances of such conflict are presented below. These include mostly the well-publicized, typically controversial

cases of citizen-industry (and sometimes government) environmental conflict.

In the United States:

- Alyeska Pipeline Service Company's five year legal battle for approval of the Trans-Alaska Pipeline.[34]
- BASF's blocked petrochemical complex in South Carolina.[35]
- Colony Development Consortium's battle with environmental groups in Colorado over oilshale mining.[36]
- Dupont's dropped plans for a titanium dioxide plant in Georgia when plans for deep well waste injection were vetoed.[37]
- Exxon's resistance from environmental groups on renewed drilling in the Santa Barbara Channel.[38]
- Olympic Refinery's battle with Durham, New Hampshire to build a refinery there.[39]
- Reserve Mining Co.'s controversial legal battle over taconite tailings from its Silver Bay, Minnesota plant.[40]
- Shell's blocked refinery in Delaware and associated "To Hell With Shell" campaign.[41]
- Union Carbide's battle with environmental groups over "the world's smokiest factory" in Alloy, West Virginia.[42]
- U.S. Steel's battle with GASP (Group Against Smog and Pollution) over cleanup of its Clairton, Penna. coke plant.[43]

In the Netherlands:

- Akzo's opposition from local groups in the Ketjen, Amsterdam area over planned organic acids plant.[44]
- Akzo's extensive governmental and citizen protest over its ship "Stella Maris" carrying poisonous chlorified aliphatics.[45]
- DSM's forced relocation of its proposed gypsum/plasterboard joint venture with Rigips because of public opposition.[46]
- General Electric's heavy protest from groups for its plans to build a phosgene plant at Bergen-op-Zoom.[47]
- Gulf Oil's forced closing of its ethylene plant at Europoort because of heavy opposition.[48]
- Hoescht's strong public opposition to its plans for a VCM/PVC complex in Vlissingen.[49]
- Hoesch-Hoogoven's (ESTEL) blocked steel mill near Rotterdam.[50]
- Oxirane's protest by environmental groups at the opening of its propylene oxide plant near Rotterdam.[51]
- Progil's cancelled plans for carbon disulfide plant near Amsterdam because of citizen protest.[52]

In the United Kingdom:

- John Mowlem's and Tylor Woodrow's battles with local citizen groups over sites to build concrete production platforms for the North Sea in Scottish Locks.[53]
- Matonas Co.'s withdrawn application to build a refinery on the Isle of Man because of environmentalist objections.[54]
- Rio Tinto Zinc's forced closing of its Avonmouth lead and zinc smelter due to lead poisoning.[55]
- Rio Tinto Zinc's battle with Friends of the Earth Ltd. over mining in Snowdonia National Park.[56]
- Rio Tinto Zinc's opposition from Anglesey, Wales groups over its aluminum smelter.[57]
- Shell's extended battle with citizen groups over a new supertanker terminal at Almwich, North Wales.[58]

In West Germany:

- August Thyssen Hütte's battle with angry Duisburg citizens over noise and dust from new blast furnace.[59]
- Bayer AG's attacks by citizen groups for building a petrochemical complex near a bird sanctuary on the Elbe River.[60]
- Bayer-BP subsidiary Erdoelchemie's blocked ethylene plant and delayed butadiene plant at Dormagen.[61]
- Dow's opposition from citizen groups over doubling the capacity of its chlorine plant at Stade.[62]
- Reynolds Metal's cutback of its Hamburg aluminum smelter to two-thirds capacity by a ruling of the court in response to a suit by environmentalists.[63]

In Canada:

- Artic Gas Pipeline System's attempt to gain a right-of-way application for a natural gas pipeline corridor.[64]
- Continental Oil Co.'s battle with the Canadian government over a "pollution fee" for its new supertanker port.[65]
- Dow's indictments for discharging mercury from its chlorine plant in Ontario.[66]
- International Nickel Co. of Canada Ltd.'s and Falconbridge Nickel Mines Ltd.'s battles with citizen and governmental groups over damage from copper and nickel smelters in Sudbury, Ontario.[67]
- New Foundland Refining Co.'s blasting from the Canadian Environment Minister over pollution abatement equipment needed in proposed oil refinery at Come By Chance.[68]

In Italy:

- Gulf Oil's shift of its refinery location from Milan due to pressure from Italia Nostra.[69]
- Soc. Italiana Serie Acetic's constant opposition from environmentalists over it chemical plant at Limito.[70]
- Montedison's long battle over the discharge of wastes from its titanium dioxide plant at Scarlino.[71]

In Ireland:

- Pfizer's battle with AnTaisce and local Cork conservationists over expansion of its citric acid plant.[72]

In Australia:

- Esso-BHP's two year delay in construction of its ethane pipeline caused by conservationist pressures and left-wing union work bans.[73]

3. News Media Attention and Influence

In a fashion similar to interest group activity, the news media in a nation is an extremely important mechanism for organizing and mobilizing demands for governmental environmental policy. Through dramatization and discussion, the mass media can serve to make the public conscious of environmental problems. The news media was judged to be especially influential in the environmental area in five nations: Canada, the Netherlands, Sweden, West Germany, and the United States. In the Netherlands, perhaps Western Europe's most pollution-conscious country, the news media has been principally responsible for sensitizing public attention. In Sweden, a government sponsored public education program channeled partly through the mass media was initiated in 1969. The press, TV and radio in West Germany have been strong advocates of the need for

environmental protection. The West German Central Government, perhaps to an extent unparalled in most other nations, has also employed the media in an attempt to sway public opinion and to extend Federal powers. Canada's press, especially in Ontario and British Columbia, has recently focused a great deal on the interrelated problems of energy and environment. The U.S. press during the period of 1970-1972 was almost obsessed with environmental issues. The faddish "front-page" interest died off, however, when "Watergate," energy, and inflation took the spotlight, but environmental issues continue to receive fairly regular "back page" coverage. In addition, the interplay between energy and the environment is also receiving attention.

As is shown in Table D.2, news media attention to, and influence in, the environmental arena was deemed to be moderate in the six nations of France, Ireland, Iceland, Britain, Australia, and Italy. In these nations either the press has not adopted an advocacy role, has shown only sporadic interest, or has been primarily concerned with other issues. News media attention and influence was judged to be rather low in Mexico as a whole, although the attention is much higher in Mexico City.

4. Environmental Protection as a Political Issue

The last column in Table D.2 is concerned with whether environmental protection has been a major political

issue. In most nations one would expect meaningful political support to probably represent a prerequisite to governmental planning in this area. As judged by reports from the various nations, it appears that environmental protection has been a relatively serious domestic political issue in only five of the countries: Australia, the Netherlands, Sweden, West Germany, and the United States. Issues of environmental protection were debated at the national level during the late 1960s in Sweden's elections, and in the early 1970s during the elections in the Netherlands, Australia, West Germany, and the United States. National political attention was catalyzed in the United States by the two issues of the SST and Trans-Alaska Pipeline. As revealed in the November 1974 elections in the U.S., environmental issues continue to be important in some parts of the nation, especially in the Great Plains states where overwhelming conflicts are taking shape between energy resource development and environmental protection.[74]

Issues of environmental protection have reportedly been politicized to a lesser extent in the countries of Canada, the United Kingdom, and France. The situation in France may be changing, however. In the recent 1974 presidential election, an environmentalist candidate, Professor René Dumont, received 1.32 percent of the votes cast. His campaign gave French environmentalists media exposure they couldn't otherwise have received and the issues raised by

Dumont attracted a surprisingly large amount of attention.[75] As a result of this recent effort it appears that the victorious President Valery Giscard d'Estaing has begun to respond to public opinion in this area, in sharp contrast to the previous Pompidou regime, which was markedly indifferent to such questions.[76] Issues related to ecology have not generally emerged as powerful national political issues in Mexico, Iceland, Ireland, and Italy.

D. DURATION OF GOVERNMENTAL INTERVENTION AND PUBLIC ATTENTION

Crude indicators of the extent of governmental intervention into the environmental protection field and of the extent of public-political attention to environmental issues have been examined above. It is necessary, however, to factor in a temporal dimension, since the intervention and attention efforts have had longer durations in some nations than others. Four indicators are employed in an attempt to gauge the duration of public environmental concern in each nation.

1. When National Environmental Protection Ministry or Agency was Created

As is revealed in Table D.3, only four nations created their national-level environmental protection organizations before 1971. The U.S. Environmental Protection Agency and the U.K. Department of the Environment were both created in 1970. Sweden's Environmental Protection

TABLE D.3

TIMING OF ENVIRONMENTAL CONCERN AND POLICY THRUST

Country	When National Environmental Protection Ministry, Dept. or Agency Created (0=not created .5=1971 or after 1=1970 or before)	When Bulk of Modern Environmental Legislation Enacted (0=1973, 1974 or not yet; .5=1970, 1971, 1972; 1= 1960s)	When Take-off Period of Public and Media Interest (0=not yet; .5=1972-1974; 1=1969-1971)	Historical Concern Factor; Significant Laws Enacted in the Past (0=1960-1974; .5=1930-1960; 1=1850-1930)
Mexico	.5	.5	0	0
Iceland	0	.5	.5	1
Ireland	0	0	.5	1
Italy	.5	.5	.5	0
France	.5	.5	.5	1
Canada	.5	.5	1	.5
Australia	.5	.5	.5	.5
United Kingdom	1	0	1	1
West Germany	.5	.5	.5	1
Netherlands	1	.5	1	.5
Sweden	1	1	1	.5
United States	1	.5	1	.5

Board was established in 1967 and the Netherland's Ministry of Public Health and Environmental Hygiene in 1962. Six of the nations either established separate agencies or added environmental sections to existing agencies after 1970. Canada's Department of the Environment received Royal assent on June 11, 1971, and France's Ministry for Protection of Nature and Environment was formed in February of 1971. Mexico, Italy, and West Germany all added environmental sections to existing agencies during that same year. Australia's Department of Environmental Conservation was created in late 1972. Ireland and Iceland have not yet created national level environmental protection organizations.

2. When Bulk of Modern Environmental Legislation was Enacted

Most nations, as shown in Table D.3, did not enact modern environmental protection legislation until the period 1970-1972. (We are operating under the assumption that legislation enacted before 1960 is probably outmoded.) One nation, however, did lead most others in the enactment of comprehensive legislation in this field. This is Sweden, which passed its National Environmental Protection Act in July of 1969. Canada had a flood of new initiatives appear in 1970 which resulted in the Water Act and Clean Air Acts of 1971. The bulk of state-level legislation in Australia and West Germany was enacted during the period

1970-1972, while national-level legislation mostly came in these two nations during 1973 and 1974. West Germany's Clean Air and Noise Abatement Act of 1974 and proposed Water Pollution Control Levy Act of 1974 are good examples. Iceland's major air pollution regulations were issued in June of 1972 under the framework Act on Toxic and Hazardous Substances of 1968. Mexico's Federal Law to Prevent and Control Environmental Contamination was passed in 1972 and Italy's regulations on air pollution were created during 1970 and 1971. France, the Netherlands, and the United States all passed fragmented pieces of legislation during the 1970-72 period. In the U.S. the National Environmental Policy Act was passed in 1970, and the Clean Air Amendments in 1970; the Federal Water Pollution Control Act Amendments, the Noise Control Act, and the Coastal Zone Management Act all came into existence in 1972. The Netherland's Surface Water Act was passed in 1970, and the Air Pollution Act, probably the most significant piece of air pollution legislation in Europe, was enacted in 1972.

Concerted efforts to create modern environmental protection legislation did not appear in Ireland or the United Kingdom until 1973. In the United Kingdom, the Protection of the Environmental Bill was introduced in the House of Lords in late 1973. This bill involves stricter regulation of various forms of pollution including land, water, noise, and atmosphere. It entails the repeal,

replacement and extension of key legislation in each of these sectors.[77] As for Ireland, one observer who concluded in 1973 that new legislative measures for environmental protection were needed also noted indications that they were on the way.[78]

3. When Take-Off Period in Public Interest Occurred

Intense public interest in environmental protection appeared in five nations during the period 1969 through 1971: the United States, Sweden, the Netherlands, the United Kingdom, and Canada. According to many observers, the rise of ecology to broad scale national prominence in the U.S. began with "Earth Day," which was celebrated on April 20, 1970.[79] This "Earth Day" involved a coordinated program of environmental teach-ins at major academic and urban centers across the nation.[80] Membership in the five largest U.S. environmental groups jumped by 400,000, or 33 percent, between 1970 and 1971.[81] In Sweden, public concern over issues of environmental quality emerged as a strong force in the late 1960s. In Canada, Britain, and the Netherlands, popular opinion in 1971 became increasingly vociferous in condemning pollution.

Intense public interest has emerged only recently (i.e., 1972-1974) in the countries of France, Ireland, Iceland, Australia, West Germany, and Italy. In 1972 students in France blocked Paris traffic to protest auto

emission fumes. Sporadic issues emerged in Italy during this period with a resulting powerful impact on public opinion, especially the youth. In West Germany and Australia the public environmental consciousness was awakened practically overnight. The only nation in which some form of intense public interest has not yet emerged is Mexico.

4. Historical Concern Factor Regarding Environmental Protection

Some nations have been concerned with issues of environmental protection for a long period of time. Significant environmental legislation was enacted during the period of 1850 through 1930 in five nations: the United Kingdom, Ireland, France, Iceland, and West Germany. As the first major country to become industrialized, the United Kingdom has the longest experience with serious environmental problems and also the longest history of combatting these problems. The first water quality laws were passed in 1388, and in 14th-century London a man was executed for causing excessive smoke from burning coal.[82] The Alkali & c. Works Regulation Act was passed in 1863 to combat air pollution and still forms the basis of the United Kingdom's air pollution control policies, although it has been amended and extended over the years. In West Germany air pollution control regulation dates back to the trades regulation of 1845. The first industry-government

water association was set up in 1904.[83] France's Law of December 19, 1917, "The charter of industrial nuisances," still serves as a major feature of the French environmental program. In a similar fashion, Iceland's Act on Water of 1923 and Ireland's Alkali & c. Works Regulations Act of 1906 are still principal pieces of environmental protection legislation in these nations.

Significant national level legislation did not appear in Canada, Australia, the Netherlands, Sweden, or the United States until the period 1930-1960. Although Canada and the United States both shared an early 1900s conservation movement, the first federal programs directed at environmental control did not begin to appear until the 1930s. Sweden's water bills were introduced in the 1950s, and the Netherland's Public Nuisance Act was passed in 1952. Australia's pollution control effort began in 1957 with the passage of the Clean Air Act in Victoria. From the available records, it does not appear that either Mexico or Italy have had any significant historical environmental concern.

E. OVERALL INDEX OF NATIONAL ENVIRONMENTAL POLICY CHARACTER

Table D.4 provides the scores attained by each nation on each of the three policy dimensions examined above. It also provides the overall score attained by each nation when the three equally-weighted scores are summed. As is

TABLE D.4

NATIONAL ENVIRONMENTAL POLICY CHARACTER INDEX

Country	Governmental Environmental Protection Organization and Machinery	Public, Interest Group, and Media Attention and Concern	Timing of Environmental Concern and Policy Thrust	Overall Index of Environmental Policy Character	
	Table D.1 Score	Table D.2 Score	Table D.3 Score	Overall Score	Overall Rank
Mexico	1.0	0.0	1.0	2.0	1
Iceland	1.0	0.5	2.0	3.5	2
Ireland	1.5	1.0	1.5	4.0	3
Italy	1.5	1.5	1.5	4.5	4
France	2.0	0.5	2.5	6.0	5
Canada	3.0	2.5	2.5	8.0	6
Australia	3.0	3.5	2.0	8.5	7
United Kingdom	3.0	2.5	3.0	9.0	8
West Germany	3.0	4.0	2.5	9.5	9
Netherlands	3.5	4.0	3.0	10.5	10
Sweden	4.0	3.0	3.5	10.5	11
United States	4.0	4.0	3.0	11.0	12

evident from the progression of scores on the three dimensions, this study found the extent of governmental intervention to be positively correlated with one another. These positive correlations imply that the overall ranking would not change very much if a number of indicators were left out. It also implies that relatively minor scoring shifts in any one of the indicators would not have a very significant effect on the overall ranking. A few remarks on the interpretation and weaknesses of this contructed index, however, are in order.

The overall score attained by any given nation is only a very crude reflection of the relative extent to which: 1) its government has intervened into the workings of the society on the behalf of environmental protection, 2) issues of environmental protection have received public and media attention and been politicized, and 3) governmental intervention and public attention have been on-going for a number of years. Our objective in aggregating these interrelated properties was to create a summary measure indicative of the relative intensity of pressures for environmentally-oriented behavior exerted from the particular social, political, and institutional setting in question. In behavioral terms a higher score would imply that the setting possesses a greater relative number of stimuli evocative of ecological incorporation tendencies. It would

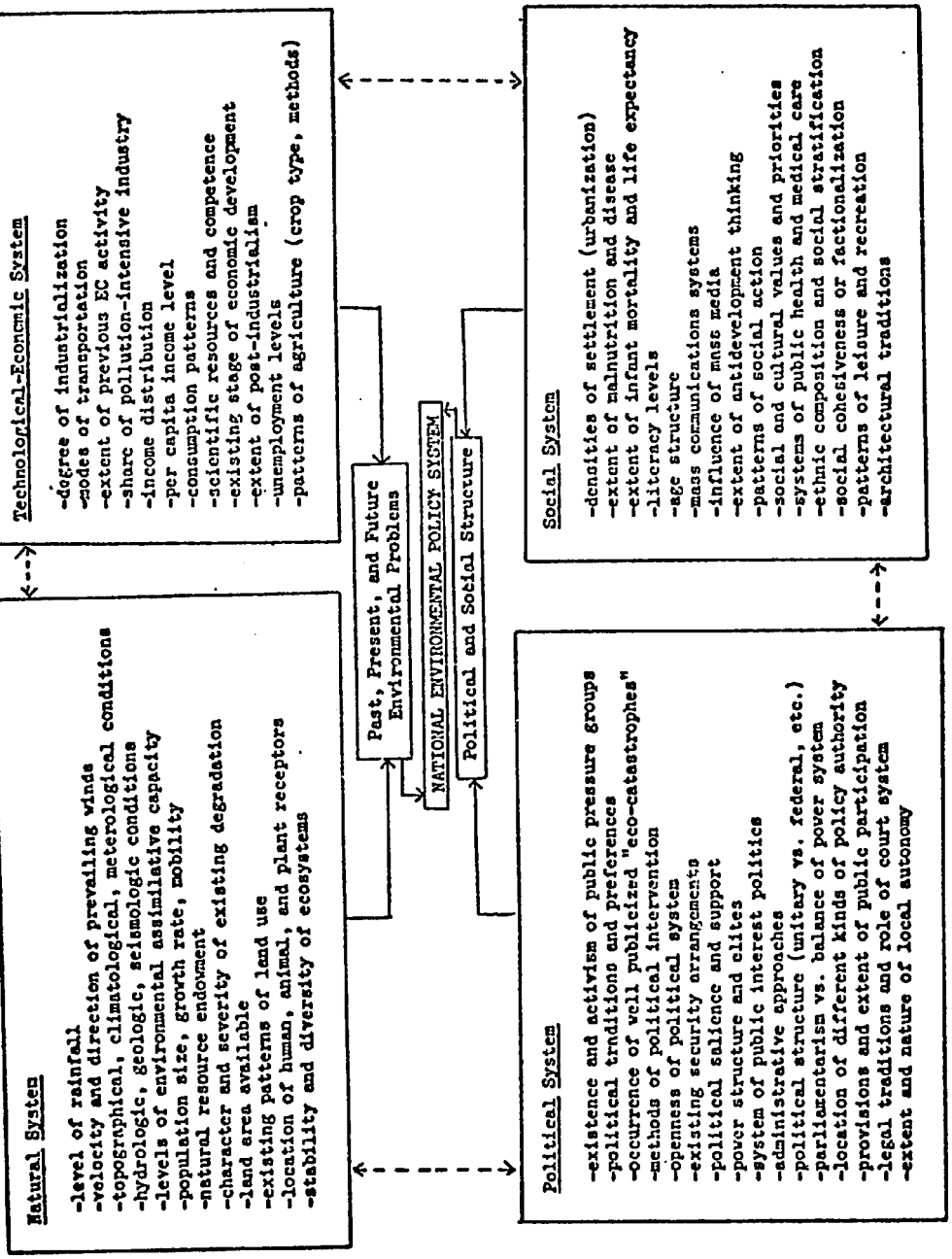
also imply a fuller adjustment of the societal reward and punishment systems with regard to encouraging such environmentally-oriented behavior. The rank order of scores attained by the twelve countries is generally consistent with two validity indicators: 1) it appears to be consistent with the postulate that the demand for environmental quality is a positive function of real per capita income, and 2) it was found to be consistent with the perceptions of many of the executives interviewed in this study (i.e., similar rankings were offered when they were asked to rank major nations in terms of pressure for environmental protection).

The index of national environmental policy character does, however, suffer from certain conceptual weaknesses. First of all, it is a very incomplete representation of national environmental policy. Many aspects, such as enforcement, governmental incentives, stringency of standards, etc., are not reflected in the index. Second, the index implicitly asserts a model of unilinear evolution, that is, that all societies are moving toward the same system of environmental policy. Although governmental intervention, public attention, and temporal duration are assumed here to be cultural universals, this may not be the case. A model of multilinear environmental policy evolution is ideally required, because the same level of effective environmental protection can probably be attained in

different ways in different societies. A preliminary model of the determinants of a national environmental policy system appears in Figure D.1. A system of national environmental policy can be viewed as a function of four interrelated systems: the natural, the technological-economic, the political, and the social systems. An examination of the tremendous diversity between nations in terms of these four subsystems necessarily leads one to believe that the resulting policy systems will differ widely. Hence, a single model of environmental policy to which all nations are compared is perhaps dangerously simplistic. In the absence of a more sophisticated model, however, it represents a useful point of departure.

FIGURE D.1

Determinants of National Environmental Policy



FOOTNOTES

APPENDIX D

[1]For an extended discussion of the issue-attention cycle concept see: Anthony Downs, "Up and Down with Ecology--The 'Issue-Attention Cycle,'" The Public Interest, No. 28 (Summer, 1972), pp. 38-50.

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[25]"Ireland - Environmental Rules," p. 25:538.

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APPENDIX E

CATEGORY SETS OF STUDY INDICATORS

CONTENTS:

E.1	Professional Involvement
E.2	Systematization
E.3	Inclusiveness
E.4	Public Participation
E.5	Continuousness
E.6	Formalization
E.7	EC Objectives and Top Management Commitment
E.8	EC Role Assignment
E.9	EC Performance Measurement
E.10	EC Research and Technology Programs
E.11	EC External Surveillance and Interaction
E.12	Public Project Examination
E.13	Project-Associated Public Pressures
E.14	Environmental Conflict Experience

APPENDIX E.1

CATEGORY SETS--INDICATORS OF PROFESSIONAL INVOLVEMENT

Indicator	No or Low	Partly or Medium	Yes or High
1. Current involvement of internal corporate environmental staff	No advisor had been assigned full-time to the project and very little part-time advice and assistance had been given.	No advisor had been assigned full-time to the project but some part-time advice and assistance had been given.	An environmental advisor had been assigned full-time to the project and/or a great deal of part-time advice and assistance had been given.
2. Current involvement of external environmental professionals	External professionals had not been utilized in such activities as survey work, technical evaluation and expert testimony.	External professionals had been utilized in only a limited fashion in such activities as survey work, technical evaluation and expert testimony.	External professionals had been utilized to a great extent in such activities as survey work, technical evaluation and expert testimony.
3. Current involvement of multi-disciplinary environmental expertise	No range of natural, social, and physical science professionals had been utilized in the planning process in addition to engineering professionals.	A limited range of natural, social, and physical science professionals had been utilized in the planning process in addition to engineering professionals	A broad range of natural, social, and physical science professionals had been utilized in the planning process in addition to engineering professionals.
4. Previous relevant involvement of environmental professionals	Environmental professionals had not been previously involved in dealing with the environmental problems associated with this kind of project.	Environmental professionals had previously been involved in a limited fashion in dealing with the environmental problems associated with this kind of project.	Environmental professionals had previously been extensively involved in dealing with the environmental problems associated with this kind of project.

APPENDIX E.2

CATEGORY SETS--INDICATORS OF SYSTEMATIZATION

Indicator	No or Low	Partly or Medium	Yes or High
1. Prestartup ecological baseline survey	No baseline survey of existing ecological conditions at the site location had been done prior to plant startup.	A limited number of baseline measurements had been included in the site engineering study prior to plant startup.	A separate baseline survey of existing ecological conditions at the site location had been done prior to plant startup.
2. Formal pre-project environmental impact assessment	No environmental impact assessment of the project had been conducted and no impact statement had been produced prior to the public hearing.	An informal environmental impact assessment of the project had been conducted and a pseudo-impact statement had been produced prior to the public hearing.	A formal environmental impact assessment of the project had been conducted and an impact statement had been produced prior to the public hearing
3. Program of residuals discharge monitoring	No program of residuals discharge monitoring, other than visual monitoring, had been incorporated into the project design.	A limited program of residuals discharge monitoring involving government operated equipment had been incorporated into the project design.	A full program of residuals discharge monitoring involving self-operated equipment had been incorporated into the project design.

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APPENDIX E.2--continued

Indicator	No or Low	Partly or Medium	Yes or High
4. Program of site location environmental media monitoring	No provisions had been made for repeat ecological baseline surveys or for monitoring of site location environmental media.	Limited provisions had been made for repeat ecological baseline surveys or for monitoring of site location environmental media.	Extensive provisions had been made for repeat ecological baseline surveys or for monitoring of site location environmental media.
5. Previous relevant environmental investigations	No environmental investigations, including residuals monitoring and remedial studies, had been done previously in conjunction with similar facilities.	A few environmental investigations, including residuals monitoring and remedial studies, had been done previously in conjunction with similar facilities.	Many environmental investigations, including residuals monitoring and remedial studies, had been done previously in conjunction with similar facilities.

APPENDIX E.3

CATEGORY SETS--INDICATORS OF INCLUSIVENESS

Indicator	No or Low	Partly or Medium	Yes or High
1. Comprehensive prestartup ecological baseline survey	No range of site location ecological conditions had been investigated in the baseline survey.	A limited range of site location ecological conditions had been investigated in the baseline survey.	A broad range of site location ecological conditions had been investigated in the baseline survey.
2. Environmental impact criteria employed in site selection	Environmental impact criteria had not been employed in siting any part of the project.	Environmental impact criteria had been employed in a limited fashion in siting at least part of the project.	Environmental impact criteria had been extensively employed in siting at least part of the project.
3. Environmental impact criteria employed in process technology selection	Environmental impact criteria had been employed only in a limited fashion in evaluating and selecting the project's central process technology.	Environmental impact criteria had been employed in a moderate fashion in evaluating and selecting the project's central process technology.	Environmental impact criteria had been extensively employed in evaluating and selecting the project's central process technology.

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APPENDIX E.3--continued

Indicator	No or Low	Partly or Medium	Yes or High
4. Comprehensive scope of environmental impact causing actions considered	Very little planning attention had been given to potential environmental impacts arising from actions other than residuals output (such as construction and transportation).	Some planning attention had been given to potential environmental impacts arising from actions other than residuals output (such as construction and transportation).	A great deal of planning attention had been given to potential environmental impacts arising from actions other than residuals output (such as construction and transportation).
5. Environmental impact criteria previously employed in design of process technology	Environmental impact criteria had been employed only in a limited fashion in previous efforts to design or modify the project's central process technology.	Environmental impact criteria had been employed in a moderate fashion in previous efforts to design or modify the project's central process technology.	Environmental impact criteria had been extensively employed in previous efforts to design or modify the project's central process technology.

APPENDIX E.4

CATEGORY SETS--INDICATORS OF PUBLIC PARTICIPATION

Indicator	No or Low	Partly or Medium	Yes or High
1. Utilization of locally-based environmental consultants	None of the external environmental consultants that had been utilized were locally-based, or no external consultants had been utilized at all.	Some of the external environmental consultants that had been utilized were locally-based.	All or most of the external environmental consultants that had been utilized were locally-based.
2. Surveys of local environmental values and perceptions	No survey of local environmental values and perceptions had been conducted.	A limited survey of local environmental values and perceptions had been conducted.	An extensive survey of local environmental values and perceptions had been conducted.
3. Active seeking of community and citizen group input	No efforts had been made to seek inputs from the site community and citizen environmental groups.	Limited efforts had been made to seek inputs from the site community and citizen environmental groups.	Active efforts had been made to seek inputs from the site coummunity and citizen environmental groups.

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APPENDIX E.4--continued

Indicator	No or Low	Partly or Medium	Yes or High
4. Initiation of community information program	No information program concerning the project had been initiated for the community.	A limited information program concerning the project had been initiated for the community.	An extensive information program concerning the project had been initiated for the community.
5. Initiation of special educational efforts	No education efforts such as tours, monitoring equipment and technical instruction had been initiated for the benefit of government officials and/or citizen groups.	Limited educational efforts such as tours, monitoring equipment, and technical instruction had been initiated for the benefit of government officials and/or citizen groups.	Extensive educational efforts such as tours, monitoring equipment and technical instruction had been initiated for the benefit of government officials and/or citizen groups.
6. Previous relevant interaction with publics on environmental impacts	Previous interaction with communities, citizen groups and governmental agencies on the environmental impacts of this kind of project had been nonexistent.	Previous interaction with communities, citizen groups and governmental agencies on the environmental impacts of this kind of project had been limited.	Previous interaction with communities, citizen groups and governmental agencies on the environmental impacts of this kind of project had been extensive.

APPENDIX E.5

CATEGORY SETS--INDICATORS OF CONTINUOUSNESS

Indicator	No or Low	Partly or Medium	Yes or High
1. Early citizen participation in planning process	Citizen awareness of the project and participation in the planning process had taken place only a few weeks before any formal hearings or permit applications, or not at all.	Citizen awareness of the project and participation in the planning process had taken place only a few months before any formal hearings or permit applications.	Citizen awareness of the project and participation in the planning process had taken place at least nine months before any formal hearings or permit applications.
2. Early ecological baseline survey in planning process	Ecological baseline survey research had been done only after the plant was already in operation, or not at all.	Ecological baseline survey research had been done only prior to the possibility of late-stage palliative design changes.	Ecological baseline survey research had been done prior to the selection of the basic project design.
3. Early inputs on environmental impact from previous experience	A low level of previous experience inputs had been present as guaged by previous professional involvement, systematization, inclusiveness, and public participation.	An average level of previous experience inputs had been present as guaged by previous professional involvement, systematization, inclusiveness, and public participation.	A high level of previous experience inputs had been present as gauged by previous professional involvement, systematization, inclusiveness, and public participation.

APPENDIX E.6

CATEGORY SETS--INDICATORS OF FORMALIZATION

Indicator	No or Low	Partly or Medium	Yes or High
1. Environmental section in internal project proposal and capital appropriations request	An environmental control narrative section had been included in the project proposal, but estimated environmental expenditures had not been included in either the capital appropriations request form or the project proposal.	An environmental control narrative section had been included in the project proposal and estimated environmental expenditures had not been included in the capital appropriations request form but were contained in the proposal.	An environmental control narrative section had been included in the project proposal and a separate section for estimated environmental expenditures had been included in the capital appropriations request form.
2. Top management environmental review and approval	Top management had not reviewed and approved the environmental aspects of the project (separately from the normal review procedures).	Top management had reviewed and approved the environmental aspects of the project in a limited fashion (separately from the normal review procedures).	Top management had extensively reviewed and approved the environmental aspects of the project (separately from the normal review procedures).
3. Corporate environmental staff environmental review and approval	The project had neither been reviewed nor approved by the corporate environmental staff.	The project had been reviewed, but not formally approved, by the corporate environmental staff.	The project had been both reviewed and approved by the corporate environmental staff.

APPENDIX E.7

CATEGORY SETS--INDICATORS OF EC OBJECTIVES
TOP MANAGEMENT COMMITMENT

	No or Low	Partly or Medium	Yes or High
1. Written formal statement of corporate environmental policy	The firm had no formal written statement of environmental policy.	The firm had no formal written statement, but had occasionally referred to environmental policies in its annual report.	The firm had a formal written statement of environmental policy.
2. Expressed objective of leadership in environmental field	The firm had never had a well-publicized expressed objective of "leadership" in the field of environmental protection.	The firm had once had a well-publicized expressed objective of "leadership" in the field of environmental protection.	The firm currently had a well-publicized expressed objective of "leadership" in the the field of environmental protection.
3. Environmental policy global in coverage	The firm's environmental policies were applied only in its home country operations.	The firm's environmental policies were only partly applied to foreign operations.	The firm's environmental policies were fully applied to all of its worldwide operations.
4. Frequent illustrations of top management support for environmental policy	Corporate environmental policies were rarely reinforced by illustrations of top management support.	Corporate environmental policies were occasionally reinforced by illustrations of top management support.	Corporate environmental policies were frequently reinforced by illustrations of top management support.

APPENDIX E.8

CATEGORY SETS--INDICATORS OF EC ROLE ASSIGNMENT

Indicator	No or Low	Partly or Medium	Yes or High
1. Corporate level EC officer and department or section	The firm had neither a corporate level EC officer nor a staff group.	The firm had a corporate level EC officer but no staff group.	The firm had both a corporate level EC officer and a staff group.
2. Corporate level top management committee	The firm had neither formed ad hoc task forces nor created a standing corporate level top management committee concerned with environmental problems.	The firm had occasionally formed ad hoc corporate level top management task forces concerned with environmental problems.	The firm had a standing corporate level top management committee concerned with environmental problems.
3. Corporate level EC officers or sections in research, PR, engineering & legal departments	The firm had corporate level EC officers or sections in none of these departments: research, PR, engineering and legal.	The firm had corporate level EC officers or sections in some of these departments: research, PR, engineering and legal.	The firm had corporate level EC officers or sections in all of these departments: research, PR, engineering and legal.
4. EC officers in major regional or divisional units, operating departments, and plants	The firm had EC officers at none of these levels: regional, divisional, operating department, and plant.	The firm had EC officers at some of these levels: regional, divisional, operating, department, and plant.	The firm had EC officers at all of these levels: regional, divisional, operating department, and plant.

APPENDIX E.9

CATEGORY SETS--INDICATORS OF EC PERFORMANCE MEASUREMENT

Indicator	No or low	Partly or Medium	Yes or High
1. Plant level EC performance regularly reported to and monitored by a corporate level unit.	Plant level EC performance was not regularly reported to or monitored by a corporate level unit.	Plant level EC performance was regularly reported to and monitored by a corporate level unit in a limited fashion.	Plant level EC performance was extensively reported to and monitored by a corporate level unit.
2. Plant managers measured and evaluated on the criterion of EC performance	EC had not been added informally or formally, as a criterion in the measurement and evaluation of plant managers.	EC had been added in an informal fashion as a criterion in the measurement and evaluation of plant managers.	EC had been added formally as a criterion in the measurement and evaluation of plant managers.

APPENDIX E.10

CATEGORY SETS--INDICATORS OF EC RESEARCH AND TECHNOLOGY PROGRAMS

Indicator	No or Low	Partly or Medium	Yes or High
1. Extent of selling relevant EC technology and services externally	The firm was not selling project relevant EC technology and services externally.	The firm was selling, as a minor line of business, project relevant EC technology and services externally.	The firm was selling, as a major line of business, project relevant EC technology and services externally.
2. Extent of self-developed project relevant EC technologies	The firm had not self-developed any project relevant EC technology.	The firm had self-developed a limited range of project relevant EC technologies.	The firm had self-developed a broad range of project relevant EC technologies.
3. Extent of engagement in basic environmental research, product impact research, & joint-industry environmental research programs	The firm was not engaged in any basic environmental research, product impact research or joint-industry environmental research programs.	The firm was engaged in a limited amount of basic environmental research, and/or product impact research, and/or joint-industry environmental research programs.	The firm was engaged in a considerable amount of basic environmental research and/or product impact research, and/or joint-industry environmental research programs.

APPENDIX E.11

CATEGORY SETS--INDICATORS OF EC EXTERNAL SURVEILLANCE AND INTERACTION

Indicator	No or Low	Partly or Medium	Yes or High
1. Extent of direct and regular corporate level contact with governmental EC agencies	Firm engages in little direct and regular corporate level contact with governmental EC agencies (relies on indirect and/or sporadic contacts).	Firm engages in a limited amount of corporate level, but some amount of plant level, direct and regular contact with governmental EC agencies.	Firm engages in considerable direct and regular corporate level contact with governmental EC agencies.
2. Extent of direct liaison with, and monitoring of, conservation groups and professional environmental organizations.	Firm engages in almost no direct liaison with, or monitoring of, conservation groups and professional environmental organizations.	Firm engages in a limited amount of direct liaison with, and monitoring of, conservation groups and professional environmental organizations.	Firm engages in a considerable amount of direct liaison with, & monitoring of, conservation groups and professional environmental organizations.
3. Extent of staff assigned to monitor EC laws, legislation, technology, events, etc.	No staff had been assigned to monitor EC laws, legislation, technology, events, etc.	A few staff executives had been formally assigned to monitor EC laws, legislation, technology, events, etc.	Many staff executives had been formally assigned to monitor EC laws, legislation, technology, events, etc.

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APPENDIX E.11--continued

Indicator	No or Low	Partly or Medium	Yes or High
4. Extent of involvement in inter-industry groups & government-industry groups on EC matters	The firm was hardly involved at all in inter-industry and government-industry groups on EC matters.	The firm was involved in a limited fashion with inter-industry and government-industry groups on EC matters.	The firm was extensively involved in inter-industry and government-industry groups on EC matters.
5. Extent of production and distribution of internal publications on EC matters	No internal publications on EC matters were being produced and broadly distributed within the firm.	A few internal publications on EC matters were being produced and broadly distributed within the firm.	A number of internal publications on EC matters were being produced and broadly distributed within the firm.

APPENDIX E.12

CATEGORY SETS--INDICATORS OF PUBLIC PROJECT EXAMINATION

Indicator	No or Low	Partly or Medium	Yes or High
1. Public hearings were required	Public hearings on the project were not required.	--	Public hearings on the project were required.
2. Environmental impact statement was required	Neither a comprehensive environmental baseline survey nor an environmental impact statement was required by law for the project.	A comprehensive environmental baseline survey, but not a formal environmental impact statement, was required by law for the project.	A formal environmental impact statement was required by law for the project.
3. Planning permissions and and/or discharge approvals were required	Neither formal planning permission nor discharge approvals were required by law for the project.	Either formal planning permission or discharge approvals were required by law for the project.	Both a formal planning permission and discharge approvals were required by law for the project.

APPENDIX E.13

CATEGORY SETS--INDICATORS OF PROJECT-ASSOCIATED PUBLIC PRESSURES

Indicators	No or Low	Partly or Medium	Yes or High
1. Stringency of demands for environmental control from governmental agencies	The demands for EC measures made by governmental agencies were rather lax.	The demands for EC measures made by governmental agencies were moderately stringent.	The demands for EC measures made by governmental agencies were especially stringent.
2. Level of opposition from citizen environmental groups	Citizen environmental group opposition and protest activity was nonexistent.	Citizen environmental group opposition and protest activity was rather weak.	Citizen environmental group opposition and protest activity was particularly strong.
3. Level of opposition from general community	No opposition, and in fact support, for the project was encountered from the general community.	Some limited opposition to the project was encountered from the general community.	A great deal of opposition to the project was encountered from the general community.
4. Extent of unfavorable local press treatment	The project received no unfavorable treatment or favorable treatment from the local press.	The project received a limited amount of unfavorable treatment from the local press.	The project received a great deal of very unfavorable treatment from the local press.

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APPENDIX E.13--continued

Indicator	No or Low	Partly or Medium	Yes or High
5. Extent of previous opposition to similar projects in same locality	No previous instances of strong opposition to similar industrial projects had occurred in the same locality.	A few previous instances of strong opposition to similar industrial projects had occurred in the same locality.	Many and/or a few particularly significant previous instances of strong opposition to similar industrial projects had occurred in the same area.

APPENDIX E.14

CATEGORY SETS--INDICATORS OF ENVIRONMENTAL CONFLICT EXPERIENCE

Indicator	No or Low	Partly or Medium	Yes or High
1. Serious delays or terminations in previous projects for environmental reasons	No serious delays or terminations of previous projects had occurred for environmental reasons.	One serious delay or termination of a previous project had occurred for environmental reasons.	Either more than one serious delay or termination of a previous project had been experienced, or one such episode had been particularly traumatic.
2. Forced closings of existing plants for environmental reasons	No forced closings of existing plants had occurred for environmental reasons.	One forced closing of an existing plant had occurred for environmental reasons.	More than one forced closing of existing plants had occurred for environmental reasons.
3. Adverse environmental publicity, boycotts and demonstrations.	No adverse environmental publicity and/or protest activity had been experienced over the last five years.	A small amount of adverse environmental publicity and/or protest activity had been experienced over the last five years.	A great deal of adverse environmental publicity and/or protest activity had been experienced over the last five years.
4. Involvement in serious environmental litigation	The firm had not been involved in any serious environmental lawsuits over the last five years.	The firm had been involved in one or two serious environmental lawsuits over the last five years.	The firm had been involved in a number of serious environmental lawsuits over the last five years.

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