

PUBLIC HEALTH PROFESSIONALS AND THE ENVIRONMENT:
A STUDY OF PERCEPTIONS AND ATTITUDES

by

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ABSTRACT

Public Health decision-makers, instrumental in the formulation and application of water quality management policy in British Columbia, have varied perceptions and attitudes as to the identification of problems and recommending solutions to them, and as to their role and the role of others in dealing with such matters. Knowledge that this is so, is important because perceptions and attitudes are ultimately reflected in public policy enactments.

Forty officials (the Medical Health Officer and Senior Public Health Inspector of each of the twenty regional Health Units in the Province) were interviewed. Information was gathered on the general biographical and professional characteristics of these professionals, their perceptions of water quality problems and potential solutions to them, and on their attitudes as to the locus of responsibility for initiating action on such matters.

The influence of factors underlying the perceptions and attitudes of Public Health professionals toward water quality management decision-making in British Columbia was analyzed in two stages. The first stage consisted of two parts: namely, the identification of those background

characteristics of Public Health officials that might influence their decision-making behaviour; and the identification of perceptions and attitudes that might affect decisions about particular problems with which they have to deal. Correlation and factor analyses techniques were used to distinguish the principal independent and dependent variables, based upon functional relationships which appeared in the data.

The second stage of the analysis employed a multiple regression technique to determine both the nature and the extent of the orthogonal relationships. Its purpose was to isolate the factors which appeared to be most significant in influencing the perceptions and attitudes of Public Health professionals.

The findings revealed that there are considerable variations in Public Health officials' perceptions of water quality management. It seems also that there are variations in perceptions of solutions, and attitudes as to the locus of responsibility for dealing with them. The results appeared to support many of the findings of other studies but also suggest additional lines for enquiry. Certain socio-psychological dimensions such as age, status, environmental and professional experiences, and views toward the man-milieu relationship, appeared to have a differing although important influence on decision-making

behaviour.

The study attempted to show how the behavioural approach to resources management has its theoretical underpinnings in a body of theory relating to both covert and overt processes developed by other disciplines, in particular psychology, sociology, and political science. The findings of the study have implications both for research relating to the human adjustment to the environment, and for public policy concerning matters of environmental quality.

Examiners:



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PROLOGUE

Once upon a time, in a land of sunshine and of mountains, there lived a people who glorified in the clearness of their air and the sparkling of their waters. "God's country," they called it, "blessed by nature's hand." And they hated those who spoiled it. "They should keep industry from polluting our streams," they said, "unless it closes industry down." "There should be a law against such smoke," they cried as they drove their powerful cars past smoking chimneys. "It's too bad water elsewhere is so polluted," they said, as they poured raw sewage into their streams, "when we have such an abundance of good clear water. We are really lucky here. We don't have a pollution problem."

Then one morning, they climbed a nearby mountain, where on a clear day you really could see forever, and all they saw was thick grey smog. They walked down again into the city, but all they could smell was the sour wash of pulp mills and the acrid stench of car exhaust. Swimming, perhaps - but on every beach there stood a sign, "Swimming prohibited. Water Grossly Polluted." Fishing? Their favorite lake was dead, green with algae and brown with human waste.

They ran howling to their scientists. "Do something," they cried. "Give back our beautiful land." But the scientists shook their heads wearily. "We cannot turn back time," they said. "Give us time and a great deal of money, and may be we can keep things from getting worse. But we cannot work miracles. You have waited too long; you have left it too late." And they pointed to shelves of reports and studies and predictions that said these things would come to pass. But they did not smile because they had been right. They would rather have been wrong.

Rosemary Neering "Pollution: The B.C. Picture," Western Homes and Living/Vancouver Life, vol. 4, No. 6 (July, 1969), p. 7.

CHAPTER 1

INTRODUCTION

Rationale For The Study

Improvement of the quality of the environment has now become a major goal of public policy in North America and in most other advanced parts of the world. In the past governments have focussed most of their attention on raising the standard of living by promoting the exploitation and development of natural resources. The main aim of public policy has been to increase the supply of goods that could be economically produced, for example, from cutting down forests, constructing hydro-power dams and reservoirs, harvesting stocks of fish, and extracting coal, petroleum and other minerals.

Such exploitation of natural resources had various effects on the environment. The nature and extent of concern about such effects, however, has changed dramatically during the past decade.¹ For centuries observers in Europe, North America, and elsewhere have been pointing out the impacts of the exploitation of natural resources, and the adverse effects of industrialization and urban-

1. Robert Arvill, Man and Environment: Crisis and the Strategy of Choice (Harmondsworth: Penguin Books, 1967).

ization on human health and welfare.² In the 19th century particularly, movements began to emerge, aiming to influence public policy to ameliorate these effects. The Conservation Movement,³ and movements to deal with slums,⁴ working conditions,⁵ and public water and sewage systems⁶ are obvious examples. Progress made in this connection, however, was mainly the result of a long dedication by particular individuals, and their ability to influence those who were concerned with the formulation of public policy. At this time a broad public concern with environmental quality had not yet materialized. As a consequence, policies relating

2. See for example various articles appearing in America's Changing Environment, Daedalus, Vol. 96 (Fall, 1967), particularly F. Fraser Darling, "A Wider Environment of Ecology and Conservation," pp. 1003-1019; and John V. Krutilla, "Some Environmental Effects of Economic Development," pp. 1058-1070.
3. The origins and the manifestations of the Conservation Movement are described in Clarence J. Glacken, "The Origins of the Conservation Philosophy," Journal of Soil and Water Conservation, Vol. 11, No. 2 (1956) pp. 63-66. Charles Van Hise, The Conservation of Natural Resources in the United States (New York: MacMillan, 1921); and Grant McConnell, "The Conservation Movement: Past and Present," Western Political Quarterly, Vol. 7 (1954), pp. 463-478.
4. Movements to deal with slums are discussed in Raymond Williams, Culture and Society: 1780-1950 (London: Chatto and Windus, 1958).
5. Movements to deal with working conditions took several forms. For a discussion of these movements, see, Sidney Lens, Working Men: The Story of La Sor (New York: MacMillan, 1961); and Poverty: America's Eluring Paradox (New York: Crowell, 1969).
6. Movements relating to public water and sewage systems are discussed in Gilbert F. White, ed., Water, Health and Society (Bloomington, Indiana: University of Indiana Press, 1969).

to impacts of resource development, urbanization, and industrialization typically ranked low in the order of priorities of most political parties, particularly in North America.

In contrast, environmental quality problems, such as pollution problems, slum problems, and the need to provide additional recreational facilities, have been frequently among the major topics debated in political campaigns in recent years. This reflects in part a growing public concern (as contrasted with isolated private concern) about such problems. Today there appears to be a growing consensus that the quality of the environment in which man makes his home, derives his living, and spends his leisure time has declined in many areas to levels he can no longer tolerate or take for granted.⁷ Popularly, this decline is referred to as "pollution". Not only do people seem to want to prevent further declines in the condition of the environment for health reasons but because of increasing leisure time and affluence, they now demand improvements in the environment to enable them to pursue outdoor recreation activities

7. Much space in newspapers and magazines and time on television and radio programmes has been devoted to expressing concern over the deteriorating condition of Man's environments. Moreover, debates have been lengthy in provincial legislatures and the House of Commons over the past few years and even political campaigners are now adopting such matters as a significant part of their platform. See, for example, Canada, Hansard, House of Commons Debates, June 23, 1969, pp. 10543-10578; and Senator Alan MacNaughton, "Environmental Quality Control," Speech on the motion to establish a Special Senate Committee on Environmental Quality Control, 23 October, 1969.

more extensively.⁸ The demand for camping, fishing, hunting and water skiing, for example, has burgeoned tremendously all over North America in the past two decades.⁹ In addition, there seems to be a growing appreciation of scenic beauty and a desire to increase opportunities to enjoy it.¹⁰ The quality of Man's environment is now assuming a leading role in decisions affecting the management of his natural resources. This has been accompanied by a shift in the approach to matters of environmental quality. In particular, researchers and policy makers have pointed out the need to make studies of perceptions and attitudes an integral part of planning and policy-making.

8. The impact of increasing affluence and the demand for outdoor recreation has been discussed by Revelle, amongst others. See Roger Revelle, "Outdoor Recreation in a Hyper-Productive Society," America's Changing Environment, Daedalus, Vol. 96 (Fall, 1967), pp. 1172-1191.
9. The burgeoning demand for various types of outdoor recreation has been described in U.S. Commission on Outdoor Recreation Resources, Reports (Washington, D.C.: U.S. Government Printing Office, 1962).
10. See, for example, Beauty for America, Proceedings of the White House Conference on Natural Beauty (Washington, D.C.: U.S. Government Printing Office, 1965).

The Role of Perceptions and Attitudes

The growing public concern about environmental quality inevitably means that decision-makers will have to adopt a new approach in dealing with such matters. In the past, decision-makers and administrators established "standards of environmental quality" which they believed reflected public needs and wants.¹¹ Criteria and enforcement were limited and became outdated all too soon. For the most part such standards were based on results of studies of the effects of various bacteria and pests on human health. Not only has the increasing number of pollutants introduced into the atmosphere, water bodies and the land made it more and more difficult to trace direct associations between particular health problems,¹² but also it appears that the desire for improved environmental quality now goes far beyond physical health considerations.¹³ It involves, for

11. Standards of environmental quality represent goals to which various groups believe society ought to aspire. Such standards reflect in part the training, experience, and particular viewpoints of the group (or groups) that propose them. In the field of environmental quality, the viewpoints of sanitary engineers and architects have been especially influential. For a discussion of standards, see B.T. Bower and W.R.D. Sewell, Selecting Strategies for Atmospheric Quality Management, Report prepared for the Department of Energy, Mines and Resources, Ottawa, December, 1969.
12. John Hewings, Water Quality and the Hazard to Health: Placarding Public Beaches, Natural Hazard Research, Working Paper No. 3 (University of Toronto, Department of Geography, 1968).
13. See, for example, René Dubos, "Human Ecology," The Jacques Parisot Foundation Lecture, Boston, Mass., July 16, 1969 (Reprinted in Canadian Council of Resource Ministers, Sources (Montreal, P.Q.: February, 1970).

example, the determining of what people perceive as pollution of a stream. Is it mainly the visual appearance of the water body, its taste or its smell? What part do the natural and man-made features adjacent to the stream play in such perceptions, and in the attitudes as to what action ought to be taken to improve its quality?

Because of Man's increasing awareness and demands on his environment decisions concerning environmental quality must increasingly take into account the perceptions and attitudes of the wide variety of individuals who affect or who are affected by any type of environmental modification. It is no longer appropriate to consider merely the "real" world but account must also be taken of the world as subjectively perceived both by the affector and the affected. Without such understanding planning and policy will be to a great extent ineffective and inefficient. It is assumed that a manager's perception of his environment and his attitudes as to the course of action taken to deal with the problems posed are central to the decision-making process and the formulation of policy. Any such decision is influenced by the decision-maker's view of what he and others value in the environment.

Various researchers have shown that the nature and degree of concern for environmental quality varies sig-

nificantly between individuals¹⁴ and between different areas.¹⁵ White has suggested, for example, that there are major gaps in perceptions of engineers and politicians as to what the public desires in the quality of domestic water supplies.¹⁶ It is also evident from other studies that public reaction to what is provided may be quite different from what policy-makers anticipated it would be.¹⁷ For example, Fonaroff found that American policies to rationalize the economy of Navajo Indians in the 1930's failed due to the lack of understanding on the part of the legislators as to the Navajo's view of his environment.¹⁸ Similarly, another study revealed that governmental policies directed towards small forest landowners in the United States have been based more on traditional European forest laws rather than on the conditions and perceptions

14. Gilbert F. White, "Formation and Role of Public Attitudes," in Henry Jarrett, ed., Environmental Quality in a Growing Economy (Baltimore, Md.: Johns Hopkins Press, 1966), pp. 105-127.
15. J. Elizabeth McMeiken and J. Rostron, "Perception of Pollution and Attitudes towards its Solution: A Pilot Study in Courtenay and Victoria, B.C.," Geographical Studies (Victoria, B.C.: University of Victoria,, Department of Geography, June, 1969).
16. White, op. cit., p. 105.
17. Social science research has shown, for example, that individuals often cannot accurately perceive the attitudes and perceptions of others, see for example, N.R. Luttbeg and H. Ziegler, "Attitude Consensus and Conflict in an Interest Group: An Assessment of Cohesion," American Political Science Review, Vol. 60 (September, 1966), pp. 200-22.
18. L.S. Fonaroff, "Conservation and Stock Reduction on the Navajo Tribal Range," Geographical Review, Vol 54 (1963), pp. 200-223.

peculiar to the American setting. As such, Quinney points out, management and control in the United States has been inadequate and to a great extent ineffective.¹⁹ In 1966, the Ontario Water Resources Commission recommended the use of Lake Erie as a solution to Southern Ontario's water supply problem but were very much surprised when the public turned it down. Similarly, such variations between perceived and actual consequences also occur in the environmental quality field.

There are important implications of the gap between the perceptions of professionals and the perceptions of the lay public. The development of public water supplies in early America was greatly deterred by the fact that many people did not believe in the germ theory of disease. It took many years for sanitation officers to find support for their efforts. One of the classic examples of misconception and ignorance in water quality policy was the decision of the New York City Board of Water Supply in the 1950's to discontinue their consideration of the Hudson River as a future water source for the region because of its assumption that the consumers would object to anything other than pure, upland sources.²⁰ The Hudson River, how-

19. Dean N. Quinney, "Small Private Forest Landownership in the United States - Individual and Social Perception," Natural Resources Journal, Vol. 3 (January, 1964), pp. 379-393.

20. W.R. Derrick Sewell, "The New York Water Crisis: An Opportunity for More Effective Management of Urban Water Supplies," Journal of Geography (November, 1966), pp. 384-389.

ever, could be one of New York's major sources of water supply. It has been used from time to time to provide water for this purpose. Numerous discrepancies between public attitudes toward environmental quality and the actual practice in the use of water sources have been explicitly illustrated in the case of other river basins.²¹

There are important variations in perceptions of environmental quality among individuals and among groups of individuals.²² The same seems to be true of attitudes, the more enduring conceptions of environmental quality.²³ Results of research have also indicated that decisions are affected by such attitudes and perceptions, and by the role of the individual in the decision-network.²⁴ Among those involved in such networks, professionals appear to play particularly important roles, as technical advisors or as administrators.

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21. See G.T. Downey, "The Significance of Governmental Policies and Attitudes in Water Pollution Control: A Case Study of the Merrimack River Valley (Unpublished Ph.D. dissertation, Clark University, Worcester, Mass., 1968).
 22. See, for example, White, op. cit., pp. 105-127.
 23. Ibid.
 24. Gilbert F. White and Fred L. Strodbeck, eds., Attitudes Toward Water: An Interdisciplinary Exploration (Chicago, Ill.,: University of Chicago, Social Psychology Laboratory and Department of Geography, unpublished manuscript, January, 1970).

The Role of the Public Health Professional

Traditionally, the responsibilities for dealing with pollutants in air, water, and land have been lodged with the Public Health professional. The present study chose to focus on two sub-groups of professionals involved with Public Health environmental matters. These are the Medical Health Officer, and the Public Health Inspector - the latter basically a sanitary engineer by training. Both have important responsibilities in dealing with matters of environmental quality. The former acts primarily in an administrative capacity while the latter provides the technical expertise on which decisions are made.

The Public Health division of the medical profession was originally created because it was recognized that there were situations which could only be dealt with effectively through group or public action, rather than through personal means. Environmental Health²⁵ provided an impetus and it continues to be one of the primary concerns of Public Health workers. As originally conceived, Public Health was

25. A list of Public Health practices in British Columbia was compiled by the Provincial Health Department. An outline of responsibility including functions relating to Environmental Health are noted in Appendix A.

defined as

. . . the science and art of preventing disease, prolonging life, and promoting health and efficiency through organized community efforts for the sanitation of the environment, the control of communicable infections . . . and the development of social machinery to ensure for every individual a standard of living adequate for the maintenance of health, so organizing these benefits as to enable every citizen to realize his birthright of health and longevity. 26

Under these auspices, matters of environmental quality have been regarded traditionally as mainly the responsibility of Public Health officials.

Environmental Public Health is composed of two main branches, (a) epidemic disease control, providing services to counter the spread of infection, and (b) sanitary hygiene, comprising services which attempt to remove or to counter harmful influences in the physical environment. It is largely out of the latter function that responsibility for the quality of the environment, or more specifically, pollution abatement has grown. In the past, specific responsibility for matters of sewage disposal and the quality of potable water supplies have been generally lodged with the Public Health Inspector. His principal role in this connection was that of a "policeman" or "watchdog." His

26. C. Fraser Brockington, "Organization and Administration of Health Service," in W. Hobson, ed., The Theory and Practice of Public Health (London: Oxford University Press, 1961), p. 306.

task was to 'control' the environment. However, through time his role has been re-defined. Today, he is delegated, in part, the greater responsibility to 'manage' the environment by employing more planning and prevention techniques.

Public Health Departments have customarily been the principal governmental agency concerned with the quality of air, water and land resources.²⁷ Although the nature of the problems of environmental quality management has changed considerably in recent years responsibility continues to be delegated generally to such Departments. In some provinces, however, new distinct and separate agencies are being established, such as Pollution Control Boards or Commissions, to aid in overcoming the problems which exist or are potentially foreseen.

In the past the role of the environmental Public Health officer has been relatively simple and clearly defined. He

27. Location of such responsibility in the hands of the Public Health professional appears to be universal. See, for example, some recent papers presented before the United Nations, World Health Organization, Expert Committee on Planning, Organization and Administration of National Environmental Health Programmes, Geneva, Switzerland, June 3-11, 1969: W.E. Gilbertson, "Current Status and Planning of Environmental Health Programmes in the United States of America," Working Paper No. 4; A.E. Martin, "Current Status and Planning of Environmental Health Programmes in the United Kingdom," Working Paper No. 5; Raoul Senault, "The Present Status of Environmental Health Programmes in France," Working Paper No. 6; P.N. Burgasov, "Environmental Sanitation in the U.S.S.R.," Working Paper No. 7; and Michio Hashimoto, "Current Status and Planning of Environmental Health Programmes in Japan," Working Paper No. 9.

was essentially "the rat catcher and privy inspector" of the community.²⁸ However, his task in recent years has become increasingly more complex. A consequence has been that Public Health is finding it necessary to shift its focus from purely physical health to include other aspects of human well-being, such as mental health as it relates to environmental control.²⁹ Another important change is that management rather than control of the physical environment has become the focus of policy.³⁰ Consequently, adequate and effective environmental quality programs and policies can only be formulated with an intensive knowledge of the environment and of how people react to changes in it. It also requires an awareness of changing public attitudes and perceptions on the part of the decision-makers or their advisors - in this case the Public Health professional.

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28. See, Edward A. Suchman, Sociology and the Field of Public Health (New York: Russell Sage Foundation, 1963), p. 124.
29. See, for example, Richard A. Prindle, "Health Aspects of the Urban Environment," Public Health Reports, Vol. 83, No. 7 (July, 1968), pp. 617-621; and Robert Alex Baron, "Noise and Urban Man," American Journal of Public Health, Vol. 58, No. 11 (November, 1968), pp. 2060-2066.
30. See John R. Fleming, "Environmental Management - A Twentieth Century Public Health Challenge," Canadian Journal of Public Health, Vol. 56, No. 1 (January, 1965), pp. 1-6. See also, Bruce Mitchell, "Water Resources Management and Public Health" (Paper presented at Tenth Annual In-Service Training Course for Public Health Inspectors, University of Waterloo, Waterloo, Ontario, May 11-15, 1970).

A Study of Public Health Professionals in British Columbia

The study presented here focusses upon the role of Medical Health Officers (Directors of Local Health Units) and Senior Public Health Inspectors in the province of British Columbia. It attempts to further understanding about decision-makers and the process by which they arrive at decisions that relate, in particular to water quality management. Its purpose is to discover the factors which appear to influence differences in the ways in which they perceive problems and solutions relating to environmental quality management, and how they perceive their role and the role of others in taking necessary action.

Outline of the Study

The theoretical underpinnings of this study are derived from concepts developed in several fields, notably psychology, political science and geography. Chapter 2 describes concepts relating to perceptions, attitudes, and personality derived principally from psychology. The process of decision-making, however, has been the main concern of political science, and more recently the geographer. Contributions of these disciplines are discussed in Chapter 3. Of the various groups involved in the decision-making process in the field of environmental quality, professionals appear to play an especially important role. This is dis-

cussed in Chapter 4. Chapter 5 describes the institutional framework within which environmental quality policy decisions are made in British Columbia and indicates the role of Public Health and the Public Health professional in this connection. The methods used in collecting and analyzing the data for the study are described in Chapter 6. This is followed in Chapters 7, 8, and 9 by a presentation of the principal findings. Chapter 7 presents information relating to the biographical and social characteristics of Public Health officials in British Columbia. Decisions relating to the quality of the environment depend in part upon the perceptions and attitudes of those who are believed to be responsible for decisions in this regard, namely Public Health professionals. Their views on environmental quality management are identified in Chapter 8. Variations in the patterns of response are explained in terms of various biographical, social, and other determining factors in Chapter 9. Finally, Chapter 10 discusses the implications of the findings of the study.

CHAPTER 2

PERCEPTIONS, ATTITUDES,
AND WATER QUALITY MANAGEMENTThe Geographer's Concern With The Environment

The ways in which men adjust to their environment have long provided a major focus for geographical enquiry. Over the years, however, explanations of patterns of adjustment have changed considerably. The methods used to study them have also altered a good deal. A progression of views as to which was the dominant partner, Man or Nature, can be traced from the late nineteenth century to the present day. Environmental determinism prevailed as a viewpoint for many years, later to be replaced by possibilism and then probablism,¹ which eventually led to the development of a fourth approach, that of cognitive behaviourism.²

Initially, geographic thought was strongly influenced by those who viewed physical environmental factors as the most important influences on human activity. Climate,

1. For a review of these views see, Gordon R. Lewthwaite, "Environmentalism and Determinism: A Search for Clarification," Annals, Association of American Geographers, Vol. 56, No. 1 (March, 1966), pp. 1-23.
2. See H. Sprout and M. Sprout, The Ecological Perspective on Human Affairs: With Special Reference to International Politics (Princeton, N.J.: Princeton University Press, 1965), especially pp. 117-141.

terrain, and vegetation were considered as determinants of settlement patterns and activities.³ The environmental determinists viewed Man's relationship to his environment, therefore, in terms of an environmental cause-and-effect response pattern. Subsequently, the views of the environmentalists were questioned by the possibilists.⁴ They viewed the environment as providing a set of opportunities to which Man might respond. Man was no longer regarded as a prisoner of Nature. To an important extent Man was viewed as being able to overcome limitations imposed by Nature, largely through cultural development and technological innovation. This provided a more realistic approach to explanations of variations in the human use of the environment. It was, however, too simplistic a view of Man's relationship to the environment. It merely suggested what men might do, rather than what they were likely

3. See, for example, the views expressed by Ellen C. Semple, Influences of Geographical Environment, on the Basis of Ratzel's System of Anthro-geography (New York: Henry Holt and Co., 1911); and E. Huntington, Civilization and Climate (New Haven: Yale University Press, 1915).
4. See, for example, the views of various environmental possibilists, P. Vidal de la Blache, Principles of Human Geography (New York: Henry Holt and Co., 1926); L.P.V. Febvre, A Geographical Introduction to History (New York: Knopf, 1925); J. Brunhes, Human Geography (Chicago, Ill.: Rand-McNally, 1920); and Carl O. Sauer, "The Agency of Man on the Earth," in William L. Thomas, Jr., ed., Man's Role in Changing the Face of the Earth (Chicago, Ill.: University of Chicago Press, 1956), pp. 49-69.

to do. The Possibilistic view has been rejected especially by Martin.⁵ He has pointed out, for example, that it enables no explanation of the location of a particular phenomenon on the grounds of cause and effect. As soon as the latter is allowed, he suggests, a deterministic view must necessarily be adopted.⁶

Predictions of human response to different environmental conditions awaited the development of a probabilistic approach.⁷ The essence of this approach was an understanding of the complex interaction of environment and social systems, and the ways in which men interpret the environment. This shift in viewpoint was the forerunner of the behavioural approach that characterizes an increasing part of geographic research today.

Harlan Barrows was one of the first geographers to emphasize the close inter-relationship between Man and his physical world.⁸ Viewing geography as human ecology, he

5. A.F. Martin, "The Necessity for Determinism: A Metaphysical Problem Confronting Geographers," Transactions, Institute of British Geographers, Vol. 17 (1951), pp. 1-11.
6. Ibid., p. 6.
7. For a discussion of the concept of "probabilism" see O.H.K. Spate, "How Determined in Possibilism?" Geographical Studies, Vol. 4 (1957), pp. 3-12; and Lewthwaite, op. cit., pp. 16-23.
8. H.H. Barrows, "Geography as Human Ecology," Annals, Association of American Geographers, Vol. 13, No. 1 (March, 1923), pp. 1-14. For a discussion of Barrows' work and influence in the field of geography, particularly in reference to the conservation of natural resources, see, for example, William A. Koelsch, "The Historical Geographers," Annals, Association of American Geographers, Vol. 59, No. 12 (December, 1969), pp. 632-651.

proposed that geographers take a broader and a more dynamic approach to the study of human activity. He advised geographers to no longer concern themselves with purely physical phenomena or human phenomena, i.e. with questions as to how Man affects Nature, or how Nature affects Man, but rather to adopt a human ecological point of view. Men, he argued, are a part of the natural ecological cycle. The process of adjustment, therefore, is continuous, and explanation of such adjustment is highly complex.⁹

Barrows' views appear to have had only modest influence upon geographic thought and geographic research when they were first put forward. Today, however, his emphasis upon the inter-relationships between various human, physical, and natural systems, and human interpretation of and response to non-human phenomena has provided the foundation for a new approach to geographic analysis.¹⁰ Lowenthal, in particular, has drawn attention to the need for a more profound understanding of how men view and interpret their environment,

9. See, for example, Robert Arvill, Man and Environment, Crisis and the Strategy of Choice (Harmondsworth: Penguin Books, 1967); and R.F. Dasmann, Environmental Conservation (New York: John Wiley and Sons, 1965).

10. See David Lowenthal, "Geography, Experience and Imagination: Towards a Geographical Epistemology," Annals, Association of American Geographers, Vol. 51, No. 3 (September, 1961), pp. 241-260.

Without a prior understanding of the bases of perception and behavior, environmental planning and improvement are mere academic exercises, doomed to failure because unrelated to terms in which people think and the goals they select. Current concern for environmental quality has already led architects and psychologists, engineers and planners, to new ways of examining how man sees the earth he lives in, and how vision affects action. Such studies, as these, moreover, stimulate awareness of habitat generally. And thereby they encourage the public to demand and ultimately, to help create better environments elsewhere. 11

Geographic explanations relating to Man's relationship to the environment have thus progressed from simplistic generalizations about cause and effect, to more sophisticated attempts to identify the various systems involved and to examine their interactions. Emphasis was now being placed on the psychological reactions of Man to various stimuli presented by the environment. While Man is regarded as having considerable control over the environment, he is also viewed as subject to various limitations which it imposes. Essentially, although various attempts for explaining human adjustment to the environment have gradually replaced each other, the behavioural approach tends to close the circle by reverting to a semi-deterministic position.¹²

What has basically been changed is the concept of environ-

11. See, David Lowenthal, ed., Environmental Perception and Behavior (Chicago, Ill.: University of Chicago, Department of Geography Research Paper No. 109, 1967), p. 3.

12. Martin, loc. cit.

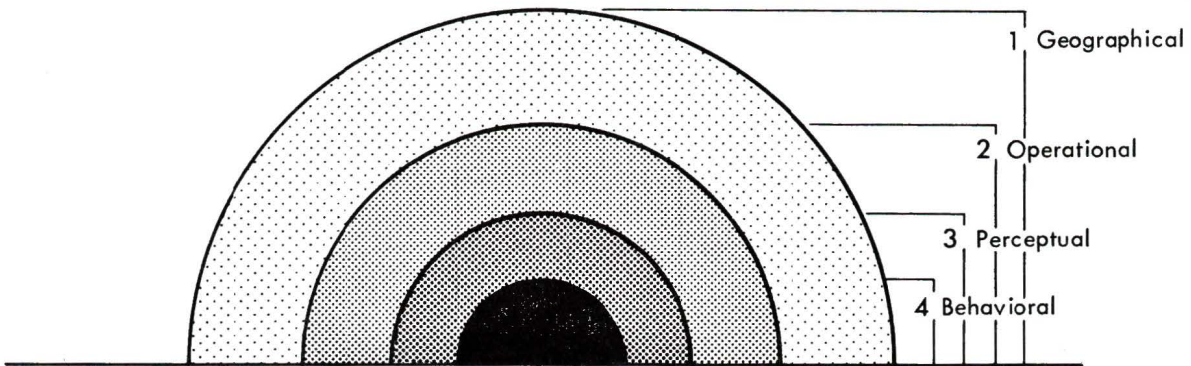
ment. The behaviourists have extended the definition to include not only physical but also human phenomena allowing a more valid and objective analysis of human response to the environment.

The Behavioural Environment

Critical to an understanding of the changing views about the relationship of Man to his environment is a definition as to what constitutes the environment. For the environmental determinist, possibilist and probablist, the environment was essentially the physical world in which Man lives, works and recreates. This, however, is too narrow an interpretation to explain patterns of human activity. Men respond not merely to rock outcrops, thunderstorms, droughts, soil formations, and animal and bird populations. They also respond to other stimuli in the environment, such as the size and shape of buildings, traffic patterns, and groups of people. Human behaviour can only be interpreted satisfactorily, therefore, if a broader view is taken of the environment. How broad that view should be, however, depends upon the purpose of the analysis.

Sonnenfeld has suggested a classification of environment, divided into 4 levels, as indicated in Figure 1. The whole environment which is external to Man might be described as the objective geographical environment. This

FIGURE 1.
PERSPECTIVES OF ENVIRONMENT
 (after Sonnenfeld)



Source: J. Sonnenfeld, "Geography, Perception and the Behavioral Environment" (Paper presented at Dallas AAAS, December 27, 1968, at Symposium on "The Use of Space by Animals and Man").

embraces all the physical systems that constitute the Earth and its immediate surroundings. Only a part of this environment, however, affects human activity. This part might be defined as the operational environment. Man is only aware of a part of the latter. He may not perceive, for example, certain opportunities which the environment offers, or limitations which it imposes. That part of the environment of which he is aware might be defined, therefore, as the perceptual environment. Perception may or may not lead to a response. Men may be aware of opportunities or limitations but may not react to them. There is a behavioral environment where it is possible to identify actual human responses to environmental

stimuli. Such stimuli may be either physical, social, or cultural in nature.¹³

Sonnenfeld's distinction between the several levels of environment appears to be supported by views of various psychologists, sociologists, anthropologists, and others who have been concerned with Man-Nature relationships. Koffka, for example, has distinguished between the "geographical" and "behavioral environments".¹⁴ He suggests that the former refers to the objective physical and social environment in which the individual is immersed, while the latter is concerned with the environment which is perceived by the individual and to which he reacts. A number of other social scientists, notably Sprout,¹⁵ Kirk,¹⁶ and Sommer,¹⁷ have tried to distinguish between

13. J. Sonnenfeld, "Geography, Perception and the Behavioral Environment" (Paper presented at Dallas AAAS, December 27, 1968, at Symposium on "The Use of Space by Animals and Man").
14. K. Koffka, Principles of Gestalt Psychology (New York: Harcourt Brace, 1935).
15. H. Sprout and M. Sprout, op. cit., see especially pp. 117-122.
16. William Kirk, "Historical Geography and the Concept of the Behavioral Environment," Indian Geographical Journal, Silver Jubilee Volume (1951), pp. 152-160.
17. See, for example, Robert Sommer, Personal Space: The Behavioral Basis of Design (Englewood Cliffs, N.J.: Prentice-Hall, 1969); Frank E. Horton and David R. Reynolds, "An Investigation of Individual Action Spaces: A Progress Report," Proceedings, Association of American Geographers, Vol. 1 (1969), pp. 70-75.

geographical and behavioural environments. Sprout refers to the behavioural environment as the "psycho-milieu", Kirk speaks of the "behavioral environment", and Sommer and others discuss "personal space".

The behavioural environment, then, is not solely a place located in physical space. It has a psychological dimension. The analysis of human response to the environment, therefore, needs to take into account those psychological factors that condition human behaviour. Perceptions, attitudes, and personality are three of the most critical elements in this connection. The recognition of the significance of such phenomena led Wright to remark: "the most fascinating terrae incognitae of all are those that lie within the minds and hearts of men".¹⁸

The Perception Process

Recent geographical research has suggested that there is a relationship between the ways in which men perceive their environment and the ways in which they adjust to it.¹⁹

An understanding of how perceptions are formed, and how

18. John K. Wright, "Terrae Incognitae: The Place of the Imagination in Geography," Annals, Association of American Geographers, Vol. 37, No. 1 (March, 1947), p. 15.
19. For a comprehensive review of such studies see, Thomas F. Saarinen, Perception of Environment, Association of American Geographers, Commission on College Geography, Resource Paper No. 5, Washington, D.C., 1969. See also Ian Burton, "The Quality of the Environment: A Review," Geographical Review, Vol. 50, No. 3 (July, 1968), pp. 472-481.

these result in various behavioural responses, therefore, is critical to an interpretation of human response to the environment.

Perception has been variously defined by psychologists and others.²⁰ In the most simplistic terms it relates to an organism's awareness of the objects and conditions that surround it. More broadly defined it embraces considerations such as values, aspirations, memories, and experiences.²¹ Essentially it is a learning process. As Russell has suggested, "Most human reactions in infancy are diffuse and general, and are only made specific through conditioning and experience; it is the special history of the group into which the human being is born that determines his subsequent selective responses, and the behavioral environment they create".²² It seems therefore, that the behavioural environment is a product of psychological, sociological, and cultural considerations.

Much of the geographical research relating to human response to the environment undertaken to date has its theoretical basis in what has been termed "cognitive behav-

20. See, Julian E. Hochberg, et. al., "Perception," in David L. Sills, ed., International Encyclopedia of the Social Sciences, Vol. 11 (New York: Macmillan, 1968), pp. 527-580.

21. S.H. Bartley, Principles of Perception (New York: Harper & Bros., 1958), pp. 8-12.

22. D.C. Russell, "Psychology and Environment," Planning Outlook, Vol. 6 (1964), p. 26.

iorism".²³ Its basic assumption is that Man's reaction to the environment is based on his past experiences which govern his perceptions and his interpretation of them. However, there is no theory of cognitive behaviourism as such. Rather, it is an approach to the study of both the overt and covert behaviour of the human being. Historically, two conflicting psychological theories, Cognitive which is rooted in the Gestalt theory of conductivity, and Stimulus-Response (S-R) theory have been used to explain the behaviour of Man.²⁴ They are conflicting because their views of the basic nature of Man are divergent.

It should be noted that the difference between the two theories is mainly one of emphasis. Stimulus-Response theory did not deny the consciousness of Man; it merely avoided it. Similarly, Cognitive theory did not exclude empirical concepts: it did not give them much emphasis. Divergences between the two theories did exist and the implications were indeed profound.

23. H. Sprout and M. Sprout, loc. cit.

24. For an excellent account of the principles and concepts underlying these two theories see selected papers in T.W. Wann, ed., Behaviorism and Phenomenology: Contrasting Bases For Modern Psychology (Chicago, Ill.: University of Chicago Press, 1964).

Cognitive Theory

Cognitive theory, built upon principles of Gestalt psychology, views perceptions as being natively given rather than learned.²⁵ It sees Man as a "rational" being constantly striving to attain a set of predetermined norms or goals in terms of a highly organized representation of the environment. Gestalt theory concerns itself primarily, with the description and explanation of the immediate experiences of the individual. Perhaps Cognitive theory is best described by Tolman in the following analogy:

/the brain/ is far more like a map control room than it is like an old-fashioned telephone exchange. The stimuli, which are allowed in, are not connected by just simple one-to-one switches to the outgoing responses. Rather, the incoming impulses are usually worked over and elaborated in the central control room into a tentative, cognitive-like map of the environment. And it is this tentative map, indicating routes and paths and environmental relationships, which finally determines what responses, if any, the animal will finally release. 26

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25. Cognitive theory is carefully described and critically appraised in F.H. Allport, Theories of Perception and the Concept of Structure (New York: John Wiley and Sons, 1955).
26. E.C. Tolman, "Cognitive Maps in Rats and Men," Psychological Review, Vol. 55 (1948), p. 189.

Stimulus-Response Theory

Stimulus-Response theory stands in sharp contrast to Cognitive theory.²⁷ It is firmly based upon learning concepts in which experience rather than innate characteristics determine perception. Man is not regarded as being primarily "rational" but rather "responsive" to varying stimuli which confront him under differing circumstances. The reaction in S-R theory is therefore the perception.

Neither theory offers a completely satisfactory explanation as to the source of perceptions and the process by which they are formed. Stimulus-Response theory, for example, is interested only in the inputs (stimuli) and the outputs (responses). It has no concern for what transforms one into the other. Cognitive theory, on the other hand, gives little consideration to inputs into the perception process. Attempts by psychologists to overcome these deficiencies have resulted in a new approach termed cognitive behaviourism.

27. See William W. Lambert, "Stimulus-Response Contiguity and Reinforcement Theory in Social Psychology," in G. Lindzey, ed., Handbook of Social Psychology (Reading, Mass.: Addison-Wesley, 1954), Vol. 1, pp. 57-90. See also Martin Scheerer, "Cognitive Theory," in G. Lindzey, ed., Handbook of Social Psychology (Reading, Mass.: Addison-Wesley, 1954), Vol. 1, pp. 91-141. For an excellent representation of John Watson's ideas and revolutionary precepts in the development of scientific psychology, see, John B. Watson, Behaviorism (Chicago, Ill.: University of Chicago Press, 1958).

Cognitive Behaviourism

The cognitive behaviourists approach is simply a tempering down of the extreme levels of behaviourism: on the one hand, the drive-reduction (Stimulus-Response) theory of Hull²⁸ and the psycho-analytic instinct theory of Freud,²⁹ and on the other, the Gestalt cognitive traditions as put forward by Tolman³⁰ and others. The debate between these two major points of view marked the early 1950's and gathered momentum during that decade. However, since 1960, dramatic progress has been made in the development and acceptance of the new approach. It would be fair to say that cognitive behaviourism emerged when human cognition was made objective and measurable by criteria that would satisfy behaviourists.³¹ A sophisticated and detailed exposition of its actual connection with existing psychological theories is lacking in the literature to date. However, its general assumptions can be briefly outlined.

28. C.L. Hull, Principles of Behavior (New York: Appleton-Century Crofts, 1943).
29. S. Freud, An Outline of Psycho-analysis (Translated by J. Strachey) (New York: Norton, 1949).
30. Tolman, op. cit., pp. 189-208.
31. For a discussion of the major principles and contentions of the controversy see D.O. Hebb, The Organization of Behavior, (New York: John Wiley & Sons, 1949); D.O. Hebb, "The American Revolution," in Robert J.C. Harper et. al., eds., The Cognitive Processes: Readings (Englewood Cliffs, N.J.: Prentice-Hall, 1964), pp. 1-16; and especially Robert W. White, "Motivation Reconsidered: The Concept of Competence," Psychological Review, Vol. 66 (September, 1959), pp. 297-333.

Cognitive behaviourism places the perception process within a stimulus-response behavioural unit which, in essence, explains a response both in terms of the actual objective stimulus qualities and in terms of perceiver qualities. It infers a cognitive or subjective reaction rather than a focus on physiological responses. It is as Miller, et. al. remarked " . . . so reasonable to insert between the stimulus and the response a little wisdom. And there is no particular need to apologize for putting it there, because it was already there before psychology arrived".³²

In order to explain individual differences in perceiving, particularly as they relate to complex Man-environment relationships, it was recognized that consideration of the relationship between the organism and the image is necessary.³³ It follows, therefore, that variables inherent in the organism (individual) such as personality, knowledge, experience and expectations, etc. are involved in the perceptive process. The process is based on learning achieved by a simple feedback operation. Once the response to a stimulus is completed, it is stored

32. George A. Miller, E. Galanter, and K.H. Pribam, Plans and the Structure of Behavior (New York: Holt, 1960), p. 2.

33. See, in particular, Kenneth H. Boulding, The Image (Ann Arbor: University of Michigan Press, 1956); and Miller, et. al., loc. cit.

within the mind and now becomes essentially an "experience" in terms of image, attitudes and behaviour, and feeds into the new perception process together with the responses effected by the new stimulus-object. The selection procedure characterizing Sonnenfeld's "behavioural environment" is implicit in the process and it is this that accounts for individual differences in perception and subsequently adjustment to Man-environment situations. This selection procedure is also described by Kirk.³⁴ He views the behavioural environment as a psycho-physical field in which phenomenal facts are arranged into patterns and acquire values in a cultural context. As illustrated in Figure 2, social and physical facts of the phenomenal environment (P.E.) are parts of the behavioural environment of the decision-maker (D) only after they have passed through a substantial filter of cultural values. However, the perception process can be analyzed in normative and predictive terms only when evaluative criteria (selection) leads to judgment processes.³⁵

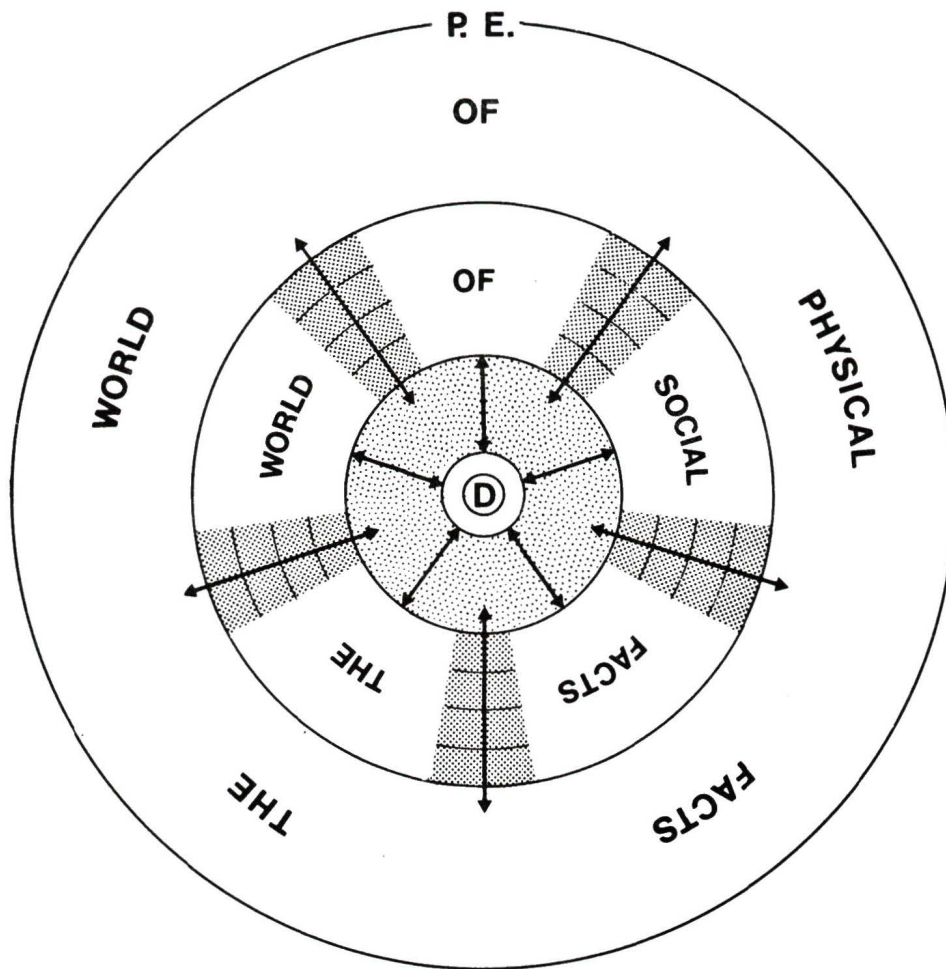
34. William Kirk, "Problems of Geography," Geography, vol. 48 (1963), pp. 357-371.

35. There are numerous theories of the judgment process and attitude formation. For example, some interesting discussions are presented in Ramon J. Rhine, "A Concept-formation Approach," Psychological Review, Vol. 65 (1958), pp. 362-370; Leonard Berkowitz, "The Judgmental Process in Personality Functioning," in Robert J.C. Harper et. al., eds., The Cognitive Processes: Readings (Englewood Cliffs, N.J.: Prentice-Hall, 1964), pp. 495-509; and Leon Festinger, "The Motivating Effect of Cognitive Dissonance," in Robert J.C. Harper et. al., eds., The Cognitive Processes: Readings (Englewood Cliffs, N.J.: Prentice-Hall, 1964), pp. 509-523.

FIGURE 2.

THE BEHAVIOURAL ENVIRONMENT: PROCESS OF SELECTION

(after Kirk)



FACTS 

VALUES 

Source: William Kirk, "Problems of Geography," Geography, Vol. 48 (1963), p. 367

Attitude Formation

A judgment process infers a relative stand either positive or negative to some accepted standard which can be either real or hypothetical. These judgments are commonly referred to as attitudes. They are the residues of evaluation of a given situation in which certain facts or values become relevant, others less relevant and certain data more crucial, others less crucial.³⁶ The perception process clearly denotes that the reaction of an individual to a stimulus does not depend entirely on the properties of the stimulus-situation, but rather on how he is psychologically set or prepared for the situation. This set, or attitude is the cognitive summation of an individual's organization of the experiences and data which he has learned from various stimulus-response situations. "It represents the residue of his previous experience with which he approaches any subsequent situation including that aspect and, together with the contemporary influences in such a situation, determines his behavior in it."³⁷ They are permanent in that such sum-

36. S.E. Asch, "Attitudes as Cognitive Structures," in M. Jahoda and N. Warren, eds., Attitudes (Baltimore, Md.: Penguin, 1966), p. 32. For a discussion of the role of stimuli in initiating responses see Isidor Chein, "The Environment as a Determinant of Behavior," Journal of Social Psychology, Vol. 39 (February, 1954), pp. 115-127.

37. Asch, loc. cit.

mations are carried over to new stimulus-response units, but temporary in that they change when new summations or organizations are acquired through experience and learning in subsequent stimulus-response units. As G.W. Allport notes, "the process of perceiving is subjectively swayed, but it is objectively anchored".³⁸ He goes on to point out that

Selective perception is as much a functional necessity as is veridical perception . . . Our coping /with the environment/ may thus be best served by disregarding some stimuli entirely, by modifying our interpretation of others by blending incoming meanings with our past habits, our present needs and our future directions. 39

Allport's concept of "proception" rather than perception offers behavioural social scientists an interesting new construct, but for purposes of this study no distinction will be made.⁴⁰

38. Gordon W. Allport, "Perception, Proception and Public Health," Personality and Social Encounter (Boston: Beacon Press, 1960), p. 297.

39. Ibid.

40. Allport claims ". . . the term we need is proception . . . it recognizes the fact that each individual carries with him his past relations to the world - his cumulated experience - and at the same time is strongly propelled into the future . . . it designates the total process of personally relevant behavior from input to act. Unlike percept, the term procept gives full weight to cumulative habit, emotional direction and all other forms of "gating" that the complex psychophysical dispositions of the individual exert upon his behavioral sequence". Ibid.

Judgments in the form of attitudes provide the behaviourists a basis to attempt response prediction, although constrained, when applied to specific stimuli. Behaviourist decision-making research is founded on the concepts of the perception process and attitude formation.

Personality Theory

Although perceptions and attitudes are basic determinants of variations in individual and group behaviour, some clarification is necessary in explaining the construct within which this transformation takes place. Personality theory provides this bridging between perception and attitudes, on the one hand, and behaviour on the other.⁴¹

41. Hunt has suggested that neither personality nor situational variables are by themselves sufficient to understand variations in behaviour; it is the interaction between them that is crucial. He claims that ". . . for either understanding variations of behavior or making clinical predictions, we should be looking toward instruments that will classify people in terms of the kinds of responses they make in various categories of situations". See J. Hunt, "Traditional Personality Theory in the Light of Recent Evidence," American Scientist, Vol. 53 (March, 1965), pp. 80-96. See also, George E. McKechnie, "The Environmental Response Inventory: Preliminary Development" (Berkeley: University of California, Institute of Personality Assessment and Research, 1969), (Unpublished report); I. Sarason, Personality: An Objective Approach (New York: John Wiley and Sons, 1966), and Gary H. Winkel, et. al., "The Role of Personality Difference in Judgments of Roadside Quality," Environment and Behavior, Vol. 1, No. 2 (December, 1969), p. 200.

Although personality has been described in a variety of contexts there has been particular stress on interpersonal dynamics. Only a few researchers have discussed the linkages between what might be termed "environmental personality" characteristics and the more traditional concepts of personality theory (i.e. social personality).

The basic difference between environmental and social personality is the existence or non-existence of social inter-action.⁴² In dealing with environmental issues the emphasis is on the individual's disposition toward the physical or non-interacting geographic environment. The significance of personality for understanding variation in environmental behaviour, as Sonnenfeld points out, relates to the fact that in all cases environmental managers (and users) are behaving individuals exposed to numerous behavioural controls and influences.⁴³ The psychological environment of the decision-maker is

42. J. Sonnenfeld, "Personality and Behavior in Environment," Proceedings, Association of American Geographers, Vol. 1 (1969), p. 137; and Kenneth H. Craik, "The Environmental Dispositions of Environmental Decision-makers," Annals, American Academy of Political and Social Science (forthcoming, May, 1970).

43. Sonnenfeld, Ibid.

. . . made up of a set of attitudes and expectations and predispositions to behavior which are a function of the individual's personality, a personality that predicts for environmental behavior within the context of the geographical environment as much as social personality predicts for social behavior within the context of the social environment. 44

Within the behavioural environment investigated by the present study some attempt was made to explore both the environmental and social characteristics inherent in the decision-makers' personalities by identifying variables which may or may not account for the variation in behaviour patterns.

Geographical and Social Science Research
On Perceptions, Attitudes and Personality

The study of variations in perceptions of the environment and their influence on human behaviour has become one of the most important new fields of geographical enquiry in recent years. As a field it is still in comparative infancy. There are only a few geographers who specialize in it. No substantive body of theory nor an adequate range of techniques for analysis have been developed thus far. Even so some very valuable contributions have been

44. Ibid.

made in both connections. Of the many fields of geography it seems to have particular promise of advancing the discipline both as a theoretical and as a practical subject.⁴⁵ Results of its research are already being used by behavioural scientists in other disciplines,⁴⁶ and by policy makers in the urban and resources fields.⁴⁷

Geographers and other behavioural social scientists have concerned themselves particularly with perceptions of such phenomena as the landscape,⁴⁸ city forms,⁴⁹ and

45. E.A. Ackerman, "Where is a Research Frontier?" Annals, Association of American Geographers, Vol. 53, No. 4 (April, 1963), pp. 429-440.
46. See, for example, various contributions in David Lowenthal, ed., Environmental Perception and Behavior (Chicago, Ill.: University of Chicago, Department of Geography Research Paper No. 109, 1967); and R.W. Kates and J.F. Wohlwill, eds., "Man's Response to the Physical Environment," Journal of Social Issues, Vol. 22, No. 4 (1966).
47. See, for example, Harvey S. Perloff, The Quality of the Urban Environment (Baltimore, Md.: Johns Hopkins Press, 1969); Robert E. Stripe, ed., Perception and Environment: Foundations of Urban Design (Chapel Hill, N.C.: Institute of Government, University of North Carolina, 1966); and C. Peter Rydell and G. Schwarz, "Air Pollution and Urban Form: A Review of Current Literature," Journal of the American Institute of Planners, Vol. 34, No. 2 (March, 1968), pp. 1-6.
48. See, for example, Robert C. Lucas, "Wilderness Perception and Use: The Example of the Boundary Water Canoe Area," Natural Resources Journal, Vol. 3, No. 3 (1963), pp. 394-411; G.M. Lewis, "Changing Emphases in the Description of the Natural Environment of the American Great Plains Area," Transactions, Institute of British Geographers, Vol. 30 (1962), pp. 75-90; and D. Lowenthal and H.C. Prince, "English Landscape Tastes," Geographical Review, Vol. 54, No. 2 (April, 1965), pp. 188-222.
49. See, for example, Anselm M. Strauss, ed., The American City: A Sourcebook of Urban Imagery (Chicago, Ill.: Aldine, 1968); John Gulick, "Images of an Arab City," Journal of the American Institute of Planners, Vol. 29, No. 3 (1963), pp. 179-268; and Kevin Lynch, The Image of the City (Cambridge, Mass.: M.I.T. Press, 1960).

natural hazards.⁵⁰ Characteristically such research has tried to fit various psychological concepts into a geographical framework. Geographers seem to be mainly concerned with the individual's perception of his physical environment, how the individual's culture and experience affect his perception and how, in turn the individual's perception affects his behaviour. The basic premise underlying much of this research appears to be that the way in which men perceive their environment has a great deal to do with the way in which they adjust to it.

Men's views of their relationship to their environment seems to have been affected very significantly by culture and the nature of the environment in which they live.⁵¹

50. See, for example, Thomas F. Saarinen, Perception of the Drought Hazard on the Great Plains (Chicago, Ill.: University of Chicago, Department of Geography Research Paper No. 106, 1966); Robert W. Kates, Hazard and Choice Perception in Flood Plain Management (Chicago, Ill.: University of Chicago, Department of Geography Research Paper No. 78, 1962); Ian Burton, et. al., The Human Ecology of Coastal Flood Hazard in Megalopolis (Chicago, Ill.: University of Chicago, Department of Geography Research Paper No. 114, 1969); and W.R. Derrick Sewell, ed., Human Dimensions of Weather Modification (Chicago, Ill.: University of Chicago, Department of Geography Research Paper No. 105, 1966).
51. Anthropologists, in studies on "lesser advanced" cultures and sociologists reveal that different cultures have completely different views of a similar environment and Man's relationship to it. See, for example, F.R. Kluckhohn and F.L. Strodtbeck, "The Comparative Study of Values in Five Cultures," in Kluckhohn and Strodtbeck, eds., Variations in Value Orientations (Evanston: Row, Peterson & Co., 1961); Andrew P. Vayda, ed., Environment and Cultural Behavior: Ecological Studies in Cultural Anthropology (New York: National History Press, 1969); E. Carpenter, et. al., Eskimo (Toronto: University of Toronto Press, 1959); Betty J. Meggers, "Environmental Limitation in the Development

Specifically, studies have shown that the general public holds a different view from that of the small private forest landowner in managing forest resources;⁵² that the

51. (continued)

of Culture," American Anthropologist, Vol. 56 (1954), pp. 801-824; Leopold Popisil, "A Formal Analysis of Substantive Law: Kapaukuan Laws of Land Tenure," American Anthropologist, Vol. 67 (October, 1965), pp. 186-213. Specifically, the motives behind one homesteader differs from another, Evan Z. Vogt, Modern Homesteaders (Cambridge, Mass.: Harvard University Press, 1955); the farmer from the rancher, J.W. Bennett, "Attitudes Towards Animals and Nature," Saskatchewan Cultural Ecology Research Field Memorandum, November, 1963; the Tanga from his neighbours, F.L.S. Bell, "The Place of Food in the Social Life of the Tanga," Oceania, Vol. 19 (1948-1949), pp. 51-73; the eastern Nigerian from the Westerner, Barry Floyd and Monica Adinde, "Farm Settlements in Eastern Nigeria," Economic Geography, Vol. 43, No. 3 (July, 1967), pp. 189-238; the forest from the grassland peoples, M. Leninger, "Ecological Behavior Variability: Cognitive Images and Sociocultural Expressions in Two Gadsup Villages" (Paper presented at the Northwest Anthropological Conference, Bellingham, Wash., April 10, 1965); and the upstream from the downstream peoples, Charles O. Frake, "The Eastern Sabanum of Mindanais," Social Structure in S.E. Asia, Viking Fund Publications in Anthropology, Vol. 29. Cultural geographers have also revealed differing interpretations of Man's relationship with his environment. See, especially, Marvin W. Mikesell, "Review Article: Geographic Perspectives in Anthropology," Annals, Association of American Geographers, Vol. 63, No. 9 (September, 1967), pp. 617-634; W.B. Morgan and R.P. Moss, "Geography and Ecology: The Concept of the Community and its Relation to Environment," Annals, Association of American Geographers, Vol. 60, No. 6 (June, 1964), pp. 339-350; and Alexander Spoehr, "Cultural Differences in the Interpretation of Natural Resources," in William L. Thomas, Jr. ed., Man's Role in Changing the Face of the Earth (Chicago, Ill.: University of Chicago Press, 1956), pp. 93-102.

52. Dean N. Quinney, "Small Private Forest Landownership in the United States: Individual and Social Perceptions," Natural Resources Journal, Vol. 3 (January, 1964), pp. 379-393.

native Eskimo differs from the "adopted" Eskimo in his view of Arctic environments;⁵³ that consulting engineers differ from government engineers in matters relating to water management;⁵⁴ and that flood plain occupants perceive their environmental relationship differently than experts.⁵⁵ As noted earlier, however, no general theory has yet emerged which accounts for these differences in view. Perhaps McKechnie and Sonnenfelds' present work will provide insightful leads in this regard.

Social science research devoted to the exploration of the interplay between human behaviour and the physical environment has witnessed three major themes: first, a general indication of the ways which men perceive and interpret their environment; second, attempts to determine whether there are differences in individual perceptions of the environment and to account for such differences; and thirdly, examinations of various groups of

53. Joseph Sonnenfeld, "Environmental Perception and Adaptation Level in the Arctic," in D. Lowenthal, ed., Environmental Perception and Behavior, op. cit., pp. 42-59.
54. W.R. Derrick Sewell "The Role of Attitudes of Engineers in Water Management," in Fred L. Strodbeck and Gilbert F. White, eds., Attitudes Toward Water: An Interdisciplinary Exploration (Chicago, Ill.: University of Chicago, Social Psychology Laboratory and Department of Geography, unpublished manuscript, January, 1970).
55. See Ian Burton and Robert W. Kates, "The Perception of Natural Hazards in Resource Management, Natural Resources Journal, Vol. 3, No. 3 (January, 1964), pp. 412-442; and Robert W. Kates, "The Perception of Storm Hazard on the Shores of Megalopolis," in D. Lowenthal, ed., Environmental Perception and Behavior, op. cit., pp. 60-74.

environmental decision-makers, identifying their similarities and differences in viewpoints and their associated behaviour.

In the first group of research the basic questions asked relate to the modes of response by which men perceive and interpret the environment - what concepts and beliefs they hold, what inferences they make and what methods and criteria they use to appraise it. Some geographers have explored the ways in which it influences the use, management and control of environmental resources. Amongst them are Lowenthal⁵⁶ and Prince⁵⁷ who have studied the views of the American and British peoples towards their own landscape identifying what these people see and what they would like to see. Tuan has noted differing cultural attitudes toward Nature and how these appear to have affected the use of the land over the years.⁵⁸ Others have revealed

56. David Lowenthal, "The American Scene," Geographical Review, Vol. 58, No. 1 (1968), pp. 61-88.

57. David Lowenthal and Hugh C. Prince, "The English Landscape," Geographical Review, Vol. 59, No. 3 (July, 1964), pp. 309-346; "English Landscape Tastes," Geographical Review, Vol. 55, No. 2 (April, 1965), pp. 188-222.

58. Y-Fu Tuan, "Attitudes Toward Environment: Themes and Approaches," in D. Lowenthal, ed., Environmental Perception and Behavior, op. cit., pp. 4-17; and "Discrepancies Between Environmental Attitude and Behavior: Examples from Europe and China," Canadian Geographer, Vol. 12, No. 3 (1968), pp. 176-191.

variations in response patterns to the concepts of wilderness,⁵⁹ architectural designs,⁶⁰ and highway aesthetics.⁶¹ The various studies noted above have shown that not only do perceptions appear to affect behaviour patterns, but also that a number of key factors account for variations in such perceptions. Included in these are culture, socio-economic and various personality characteristics.

A second theme has been the identification of variations in individual perceptions of the environment.

59. See, for example, R.C. Lucas and G.B. Priddle, "Environmental Perception: A Comparison of Two Areas," Annals, Association of American Geographers, Vol. 54, No. 3 (September, 1964), pp. 428-429; and R.C. Lucas, "The Contribution of Environmental Research to Wilderness Policy Decisions," Journal of Social Issues, Vol. 22, No. 4 (October, 1966), pp. 116-126.
60. David Canter, "An Intergroup Comparison of Connotative Dimensions in Architecture," Environment and Behavior, Vol. 1, No. 1 (June, 1969), pp. 37-48; A.E. Parr, "Environmental Design and Psychology," Landscape, Vol. 14, No. 2 (Winter, 1964-65), pp. 15-18; and A.E. Parr, "Psychological Aspects of Urbanology," Journal of Social Issues, Vol. 22, No. 4 (October, 1966), pp. 39-45.
61. The most notable forerunner in this field of research is found in Kevin Lynch, loc. cit. Other works include: D. Appleyard, K. Lynch and J.R. Myer, The View from the Road (Cambridge, Mass.: M.I.T. Press, 1964); and Robert W. Kates, "Stimulus and Symbol: The View from the Bridge," Journal of Social Issues, Vol. 22, No. 4 (October, 1966), pp. 21-28.

Studies have attempted to discover, for example, whether people in different socio-economic classes have differing perceptions of the same environment, or problem,⁶² and whether people in different locations have differing perceptions of a similar problem, such as water pollution,⁶³ air pollution,⁶⁴ or opportunities, such as preferred places to live.⁶⁵ Studies of this type have been undertaken by researchers in other disciplines too,

62. See Gilbert F. White, "Formation and Role of Public Attitudes," loc. cit.; and Fred L. Strodbeck, "Weather Modification as an Uncertain Innovation," in M.E. Garnsay and J.R. Hibbs, eds., Social Sciences and the Environment (Boulder, Colo.: University of Colorado Press, 1967), pp. 103-124.
63. See, for example, Mary L. Barker, "The Perception of Water Quality as a Factor in Consumer Attitudes and Space Preferences in Outdoor Recreation" (Unpublished M.A. Thesis, Department of Geography, University of Toronto, 1968); and H. George Frederickson and Howard Magnas, "Comparing Attitudes toward Water Pollution in Syracuse," Water Resources Research, Vol. 4, No. 5 (October, 1968) pp. 877-889.
64. See, for example, D.R. Lycan and W.R.D. Sewell, "Water and Air Pollution as Components of the Urban Environment of Victoria," Geographical Perspectives (Vancouver, B.C.: Tantalus Press, Spring, 1968), pp. 13-18; and J. Elizabeth McMeiken and John Rostron, "Perception of Pollution and Attitudes Toward its Solution: A Pilot Study in Courtenay and Victoria, B.C.," Geographical Studies (Victoria, B.C.: University of Victoria, Department of Geography, June, 1969).
65. Peter R. Gould, "Structuring Information on Spacio-Temporal Preferences," Journal of Regional Science, Vol. 7, No. 2 (Winter, 1967), pp. 249-274; and Peter Gould, "Problems of Space Preference Measures and Relationships," Geographical Analysis, Vol. 1, No. 1 (January, 1969), pp. 31-44.

notably in psychology and sociology.⁶⁶ Such research has been helpful in emphasizing the importance of taking into account individual as well as group perceptions, in planning decisions. However, much of this work has been focused solely on perceptions, and little attempt has been made to identify the links between them and overt behaviour. As a consequence there remain gaps in understanding of how people are likely to respond to changes in environment, and of how perceptions themselves might be altered.

66. The work of Craik at the Institute of Personality Assessment and Research at Berkeley has been notable, particularly in its theoretical contribution to environmental psychology research. See, for example, Kenneth H. Craik, "The Comprehension of the Everyday Physical Environment," Journal of the American Institute of Planners, Vol. 34, No. 1 (January, 1968), pp. 29-37; and "Environmental Psychology," New Directions in Psychology (New York: Holt, Rinehart & Winston, 1970), pp. 1-121. The problems associated with air quality have been the research focus for several sociologists and psychologists. See, Ido de Groot, "Some Airy Platitudes about Attitudes - Trends in Public Attitudes Towards Air Pollution" (Paper 67-71, presented at A.P.C.A. meeting, Cleveland, Ohio, June 12-16, 1967); and M. Jay Crowe, "Toward a 'Definitional Model' of Public Perceptions of Air Pollution," (Paper 67-68, presented at A.P.C.A. meeting, Cleveland, Ohio, June 12-16, 1967). See also, N.Z. Medalia and F.L. Finker, Community Perception of Air Quality: An Opinion Survey in Clarkston, Washington (Cincinnati, Ohio, Division of Air Pollution, U.S.P.H.S. Report No. 999-AP-10, 1965); J. Schusky, et. al., "Methodology for the Study of Public Attitudes Concerning Air Pollution," Journal of the Air Pollution Control Association, Vol. 14 (1964), pp. 445-448; I. de Groot, et. al., "People and Air Pollution: A Study of Attitudes in Buffalo, N.Y.," Journal of the Air Pollution Control Association, Vol. 16 (1966), pp. 245-247; and E.S. Smith, et. al., "Public Reaction to Air Pollution in Nashville, Tennessee," Journal of the Air Pollution Control Association, Vol. 14 (1964), pp. 418-423.

The third major theme investigating the relationship between human behaviour and the environment has focused on environmental decision-makers, such as architects, urban designers, landscape architects, and natural resource managers. Behavioural social scientists have tried to identify the characteristics of these decision-makers in terms of their environmental dispositions and other personality dimensions.

In an inter-disciplinary study at the University of Chicago, Konrad, et. al., identified characteristics of decision-makers in the water resources field in the N.E. Illinois area.⁶⁷ Sewell has studied government engineers and consulting engineers in British Columbia,⁶⁸ and MacIver has researched various types of decision-makers involved in water planning in Southern Ontario.⁶⁹ O'Riordan is involved in research on participants in water management

67. Herman W. Konrad, "Decision-Makers and Their Decisions," in Fred L. Strodbeck and Gilbert F. White, eds., Attitudes Toward Water: An Inter-Disciplinary Exploration (Chicago, Ill.: University of Chicago, Social Psychology Laboratory and Department of Geography, unpublished manuscript, January, 1970).

68. Sewell, "The Role of Attitudes of Engineers in Water Management," loc. cit.

69. Ian MacIver, "Urban Water Supply Alternatives: Perception and Choice in the Grand Basin, Ontario" (Unpublished Ph.D. dissertation, University of Chicago, Department of Geography, 1969).

decisions in the Okanagan region of British Columbia.⁷⁰

Decision-making in Massachusetts and elsewhere has been examined by Kasperson, with a view to identifying factors that appear to shape decisions on water matters.⁷¹ Kates et. al., have taken this work further in a study of drought in the N.E. area of the United States.⁷²

Such research has contributed much to furthering understanding of the ways in which perceptions and attitudes affect decision-making in the resources management field and have identified some of the factors that help shape perceptions and attitudes. Amongst those factors considered influential in such matters, although varying in relative degree and significance, age, sex, education, knowledge of the problems, residence and travel experience, leisure time interests, professional training and role-playing, and other socio-cultural and personality traits have been noted.

70. Timothy O'Riordan, "Factors Affecting the Perceptions and Attitudes of Participants in Decision Making in Resources Management: A Strategy for Public Involvement" (Paper presented at Symposium on the Role of Perceptions and Attitudes in Decision Making in Resource Management, Victoria, B.C., April 13-14, 1970).

71. See for example, R.E. Kasperson, "Political Behaviour and the Decision-Making Process in the Allocation of Water Resources Between Recreational and Municipal Use," Natural Resources Journal, Vol. 9, No. 4 (April, 1969), pp. 176-211.

72. R.W. Kates, et. al., Drought and Water Supply: The Implications of the Massachusetts Experience for Municipal Planning (Baltimore, Md.: Johns Hopkins Press, forthcoming).

Summary

Man's interaction with his environment is a highly complex matter and not one which might be explained as a simple causal relationship between the stimulus properties of the environment and the response patterns of an individual. Environment is itself an ambiguous concept. However, geographers, psychologists and others have recognized the significance of the relatively recent behavioural orientation in the social sciences and its implications for public policy-making and have attempted to explore the need for more appropriate theories and methods for study. A more valid and accurate explanation of the transactions between Man and his environment is found firmly rooted in the psychological theories relating to the principles of perception, attitudes, personality, and behaviour. This chapter has dealt with the first three of these dimensions which together represent the covert processes taking place within the behaving individual. Chapter 4 discusses the fourth dimension, that of overt behavioural practices within the context of a decision-maker's functional environment.

CHAPTER 3
APPROACHES TO THE STUDY OF DECISION-MAKING IN
RESOURCES MANAGEMENT

Introduction

Various approaches have been used in the study of decision-making, and especially that which relates to resources management policies. Studies have focused either upon normative models, which specify what might be attained, given certain goals and assumptions, or upon the actual interplay of forces in the power structure. The latter might be described as a behavioural approach. It has been applied to decision-making in political science for several decades, but only recently in other disciplines. Even in political science, however, the emphasis upon the behaving individual has been more implicit than explicit.¹

The awakening of a behavioural approach to political science was part of the larger revolutionary movement within the social sciences resulting from the impact of the natural

1. See, William J. Gore and Fred S. Silander, "A Bibliographical Essay on Decision Making," Administrative Science Quarterly, Vol. 4 (June, 1959), pp. 97-121.

sciences on the behavioural sciences.² One of the leaders in promoting this approach in political science was Charles Merriam. Viewing political science as " . . . a discipline the primary purpose of which has been the accumulation of facts about the history, agencies, processes, structures, functions, compositions, rationale, successes, and failures of legal governments,"³ Merriam, in 1921, urged his colleagues to attend more to the methods and findings of sociology, social psychology, geography and biology, and other disciplines.⁴ He suggested a new approach to political science based on goals, methods, procedures and focus of political behaviour.⁵ His student, Harold Lasswell went on to emphasize and illustrate the use of psychological categories in the study of politics.⁶

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2. Evron M. Kirkpatrick, "The Impact of the Behavioral Approach on Traditional Political Science," in Austin Ranney, ed., Essays on the Behavioral Study of Politics (Urbana, Ill.: University of Illinois Press, 1962), p. 14.
 3. Ibid., p. 6.
 4. C.E. Merriam, "The Present State of the Study of Politics," American Political Science Review, Vol. 15 (1921), pp. 173-185.
 5. See, C.E. Merriam, New Aspects of Politics (Chicago, Ill.: University of Chicago Press, 1925).
 6. See, for example, H.D. Lasswell, Politics: Who Gets What, When, How (New York: McGraw Hill, 1936); and Power and Personality (New York: W.W. Norton and Co., 1948).

Perhaps the most important principle underlying the new approach was that it rejected political institutions as the basic unit for research and adopted the behaviour of individuals in political situations as the main focus of study. Subsequent research in political behaviour has emphasized the attitudes and motivations of individuals in an effort to discover the effects of personality on behaviour in political situations, on the one hand, and the effects of political situations - such as their structure, rules of procedure, etc. - on personality, on the other. Until about 1956 these studies were focused mainly upon voting behaviour.⁷ There continues to be a considerable amount of literature in the latter connection but the behavioural approach has begun to pervade many other branches of the study of politics. In particular there has been increasing interest in the interactions between personality and public policy situations.

The behavioural approach has also been adopted by researchers in other disciplines who are interested in decision-making, notably those in the policy sciences such

7. For reviews of research conducted before 1955, see S. M. Lipset, et. al., "The Psychology of Voting," in G. Lindzey, ed., Handbook of Social Psychology (Cambridge, Mass.: Addison-Wesley, 1954), pp. 1124-1175; and P.H. Rossi, "Four Landmarks in Voting Research," in E. Burdick and A.J. Brodbeck, eds., American Voting Behavior (Glencoe, Ill.: The Free Press, 1949), pp. 222-280. For an excellent review of studies after 1955, see H. Eulau, Recent Developments in the Behavioral Study of Politics (Palo Alto, Calif.: Stanford University Press, 1961).

as economics, sociology, and geography. Some valuable contributions have been made to understanding how decisions are made, and it is now possible to predict outcomes of certain decision-making situations.⁸ Workers in the various disciplines have been profoundly influenced by the research of several social scientists in this connection, notably Simon,⁹ Easton,¹⁰ and

8. Several reviews of the approaches to the study of decision-making have appeared in the literature, see, in particular, Gore and Silander, loc. cit.; and Peter H. Rossi, "Community Decision Making," Administrative Science Quarterly, Vol. 1 (March, 1957), pp. 415-443. See also, James G. March, "Some Recent Substantive and Methodological Developments in the Theory of Organizational Decision-Making," in Austin Ranney, ed., Essays on the Behavioral Study of Politics (Urbana, Ill.: University of Illinois Press, 1962), pp. 191-208; George Katona, "Rational Behavior and Economic Behavior," Psychological Review, Vol. 60, No. 5 (1953), pp. 307-318; Herbert A. Simon, "Theories of Decision-Making in Economics and Behavioral Science," American Economic Review, Vol. 49 (June, 1959), pp. 253-283; and James D. Thompson, ed., Comparative Studies in Administration (Pittsburg, Penn.: University of Pittsburgh Press, 1959), especially Chapter 12: "Strategies, Structures, and Processes of Organizational Decision," pp. 195-216.
9. See, for example, Herbert A. Simon, Administrative Behavior: A Study of Decision Making Processes in Administrative Organization (New York: Glencoe Free Press, 1957); (an excellent review and criticism of Simon's theories as presented in this book are discussed by Edward C. Banfield, "The Decision-Making Schema," Public Administration Review, Vol. 17 (Autumn, 1957), pp. 278-285); James G. March and Herbert A. Simon, Organizations (New York: John Wiley and Sons, 1958); and Herbert A. Simon, Models of Man (New York: John Wiley and Sons, 1957).
10. See, for example, David Easton, "An Approach to the Analysis of Political Systems," World Politics, Vol. 9 (April, 1957), pp. 383-400; A Systems Analysis of Political Life (New York: John Wiley and Sons, 1965); and A Framework for Political Analysis (Englewood Cliffs, N.J.: Prentice-Hall, 1965).

and Etzioni.¹¹

A number of geographers have interested themselves in problems of decision-making particularly in the fields of urban development, transportation and resources management. Some have made useful contributions to theory in this connection, notably White,¹² Burton,¹³ Wolpert,¹⁴ Hamill,¹⁵ and Gould.¹⁶ Research by several of them has

11. Amitai Etzioni, "New Directions in the Study of Organizations and Society," Social Research, Vol. 27 (Summer, 1960), pp. 223-228; and "Mixed-scanning: A 'Third' Approach to Decision-Making," Public Administration Review, Vol. 27 (December, 1967), pp. 385-392.
12. Gilbert F. White, "Contributions of Geographical Analysis to River Basin Development," in Ian Burton and R. W. Kates, eds., Readings in Resource Management and Conservation (Chicago, Ill.: University of Chicago Press, 1960), pp. 375-394. See also, Gilbert F. White, Strategies of American Water Management (Ann Arbor: University of Michigan Press, 1969); Committee on Water, National Research Council, Gilbert F. White, Chairman, Water and Choice in the Colorado Basin: An Example of Alternatives in Water Management, Publication 1689 (Washington, D.C.: National Academy of Sciences, 1968).
13. See, Ian Burton, "Towards More Rational Decision Making in India's Water Resource Development," Indian Journal of Power and River Valley Development (June, 1969), pp. 1-7.
14. See, in particular, Julian Wolpert, "The Decision Process in its Spatial Context," Annals, Association of American Geographers, Vol. 54, No. 4 (December, 1964), pp. 537-558; and "Behavioral Aspects of the Decision to Migrate," Regional Science Association Papers, Vol. 15 (1965), pp. 159-169.
15. Louis Hamill, "The Process of Making Good Decisions about the Use of the Environment of Man," Natural Resources Journal, Vol. 8, No. 2 (April, 1968), pp. 279-301.
16. Peter R. Gould, "Man Against His Environment: A Game Theoretic Framework," Annals, Association of American Geographers, Vol. 53 (September, 1963), pp. 108-121.

resulted in valuable insights into factors that influence decisions. Studies concerning the use of flood plains,¹⁷ the provision of urban water supplies,¹⁸ and forest management¹⁹ are illustrative of the kinds of problems studied and the approaches taken. In particular, this research has resulted in the identification of decision-making networks and in the construction of models aiming to identify factors that influence choices at various points in the decision-making process.

17. See, for example, Gilbert F. White, et. al., Papers on Flood Problems (Chicago, Ill.: University of Chicago, Department of Geography Research Paper No. 70, 1961); Robert W. Kates, Hazard and Choice Perception in Flood Plain Management (Chicago, Ill.: University of Chicago, Department of Geography Research Paper No. 78, 1962); W.R. Derrick Sewell, Water Management and Floods in the Fraser River Basin (Chicago, Ill.: University of Chicago, Department of Geography Research Paper No. 100, 1965); and Ian Burton et. al., The Human Ecology of Coastal Flood Hazard in Megalopolis (Chicago, Ill.: University of Chicago, Department of Geography Research Paper No. 115, 1968).
18. See, for example, Roger E. Kasperson, "Political Behavior and the Decision-Making Process in the Allocation of Water Resources Between Recreational and Municipal Use," Natural Resources Journal, Vol. 9, No. 5 (April, 1969), pp. 176-211; and Shue Tuck Wong, Perception of Choice and Factors Affecting Industrial Water Supply Decisions in Northeastern Illinois (Chicago, Ill.: University of Chicago, Department of Geography Research Paper No. 117, 1969).
19. Hamill, loc. cit.

Decision-Making Networks

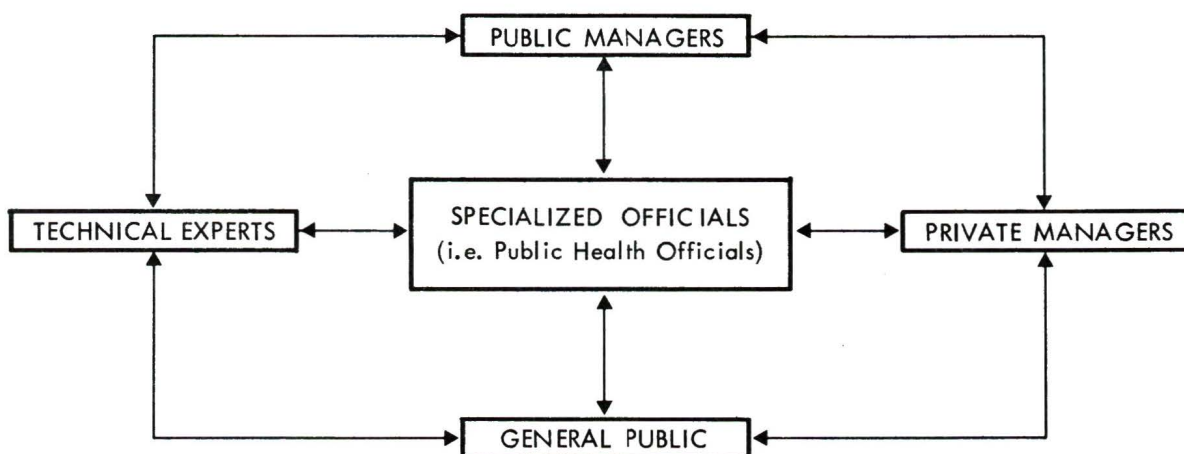
Decisions relating to the management of the environment are made by resource managers²⁰ who act either in their own right or on behalf of others. Some decisions are relatively simple, and may involve only one man. A farmer, for example, has to decide on which day he should plant his crop or harvest it. His decision in this connection is subject mainly to his own appraisal of the situation. He may consult others, such as his neighbours or the local meteorologist or government agent, but in the last analysis the decision is his. Other decisions are much more complex and may involve many people, directly or indirectly. This is especially the case where the use of the environment for one purpose impairs its use for other purposes. In such cases several distinct groups may participate in or influence decisions. Their influence is transmitted in various ways through the decision-making network.

Figure 3 illustrates a simple network, composed of

20. A resource manager is defined here as anyone who in some way affects decisions as to the use of the environment. A manager does not necessarily own or hold title to the segment of the environment involved. Farmers are clearly resource managers but so also are those who live in flood plains or those who choose to live in arid areas. Officials of parks agencies are obviously resource managers but so also are members of pressure groups.

FIGURE 3.

A SIMPLE DECISION-MAKING NETWORK



several groups of interested parties (or actors)²¹ who play distinctive roles in decisions, and who are interconnected by various channels of influence. Decisions relating to Public Health may be used as an example. In this case five main groups of actors may be identified:

- (i) Public Managers. These are federal, provincial and local officials who have legally and administratively defined responsibilities for taking action on matters in the public domain.
- (ii) Technical Experts. These are drawn from a variety of disciplines. In the case of Public Health, those with a background in medicine or natural science are especially important, although engineers and lawyers are sometimes called upon.

21. Infra, pp. 59-61.

- (iii) Private Managers. These are either private individuals who make decisions or private individuals who make decisions on behalf of a private group, such as an industrial concern, that may affect Public Health in some way.
- (iv) General Public. This is the populace at large. It may be subdivided in various ways, such as according to sex, age, or income, or according to geographical area. It influences decisions in a variety of ways, such as voting, contacting government agencies, or through pressure groups.
- (v) Specialized Officials. These are the officials in government agencies that are assigned responsibilities for dealing with specific problems, in this case Public Health. In a sense they are the "hub" of the decision-making network, receiving messages from other elements of it, and influencing the actions of the latter in various ways.

Each group affects decisions elsewhere in the network through various channels of influence some of which are formal and others informal. Directives and regulations are examples of formal channels of influence. Customs, mores, and pressure groups are informal channels. The more complex the issue, the more groups will be involved,

and the greater the tendency will be to formalize channels of influence.

Particular individuals may belong to more than one group in a decision network and may play different kinds of roles in each of them. Thus an engineer could be a technical advisor, employed by a government agency, while at the same time being a member of the general public. In each capacity he could be either "active" or "passive" in the decision-making process, opting either to influence action directly, or to leave the decision to others.

Snyder's Theory of Decision-Making Behaviour

As noted earlier, the analysis of decision-making can be approached in several ways. Snyder, a political scientist, has suggested that the various types of analysis can be classified into two main groups: (a) interaction, and (b) decision-making.²² Most decision-making models appear to be based on the former approach. It describes and measures interactions in terms of perceived problems and alternatives and the patterns of interaction between individuals, groups, and organizations. Essen-

22. Richard C. Snyder, "A Decision-Making Approach to the Study of Political Phenomena," in Roland Young, ed., Approaches to the Study of Politics (Evanston, Ill.: Northwestern University Press, 1958), pp. 3-38.

tially it indicates what decisions are made and who makes them. Interaction analysis, however, cannot yield answers to the question why decisions emerged the way they did. Such explanations must be sought in the alternative approach - decision-making analysis. Both Simon's "Satisficing Man"²³ and Snyder's "Motivating Man" are based on variations of this theme.

Snyder's basic thesis is based upon the decision-making approach. It revolves around the concept of decision-makers cast in the role of actors performing in a political arena. He points out that the key to political action lies in the ways in which decision-makers as actors perceive their situation. He proposes that any organizational system or unit can be analyzed in terms of three significant determinants of decision-making behaviour: (a) spheres of competence; (b) communication and information; and (c) motivation. Furthermore, these three variables deal with decision-making from two fundamentally different perspectives: the properties of the system (i.e. its structure and process) and the actor (the individual decision-maker).

Spheres of competence are defined, by Snyder, in terms of (i) the presence of prescribed job specifications, and (ii) conventional rules; that is patterns of action established and sanctioned by precedent and habit. Specifically,

23. Simon, Administrative Behavior, loc. cit.

the competence of an actor involves " . . . his qualifications to act, his authority to act, and the expectation that he will act, and that his action will be received in a certain way."²⁴ The principal basis of an actor's participation in the decision-making process is either that of an advisor, when he is brought into the system because of a need for special skills and information, or as a decision-maker. However, an important organizational phenomenon, as Snyder notes, is that through time those in an advisory capacity tend to become decision-makers because their advice is accepted as a sound basis for decisions.

The communications and information net, which covers most organizations and agencies, functions not only to support and confirm the structure of authority but also serves to activate particular patterns of predecisional and decisional activity and to make possible uniform definitions of the issue or problem among the decision-makers. Information such as the facts presented by the problem and its setting, and knowledge as to previous consequences of action may be viewed as a feedback for the decisional system.

The third significant factor which influences, in part, both the direction and nature of the competence sphere and communications network is that of motivation. Snyder, 24. Snyder, op. cit., p. 25.

defines motivation as " . . . the psychological state of the actor in which energy is mobilized and selectively directed toward aspects of the setting".²⁵ He points out that motivational analysis, if properly conceived, ought to provide a more satisfactory foundation than is presently utilized, for linking the setting (i.e. agency) and the unit (actor). Snyder suggests that this principle of motivation might offer a way to synthesizing the concepts of perceptions, attitudes and personality. However, he goes on to caution, that motivation is only one component of action (or behaviour) and that only the motivational factors which may help to account for a decision-maker's behaviour in a particular system of activities (or behavioural unit) are of particular significance. Interest in whole, real, and discrete persons together with their complex innate drives is of no relevance in this regard. The motives which are of primary concern to the analyst are those which are acquired not structurally determined (i.e. inherent in the physiology of the organism). Tendencies learned from experience and training and from his membership and participation in the decision-making system, which might effect the perception and evaluation of problems and conditions are of major concern. Even though Snyder's discussion is based primarily on a sociological rather than a psychological concept of personality the concept of an

25. Ibid., p. 32.

environmental personality previously described can be included in his framework.²⁶

The conceptual models of Simon and Snyder have, however, received a certain amount of criticism from other political scientists involved with the behaving political individual. These criticisms do not attack the basic principles underlying the theories but rather assert that both Simon and Snyder are too narrow in their conceptions and emphases. The critics contend that the Simon and Snyder theories are faulty rather than incorrect. Vickers, in his treatise The Art of Judgment, accepts many of Simon's ideas, but attempts to "adopt a more explicitly dynamic conceptual model of an organization and of the relations, internal and external, of which it consists, a model which applies equally to all its constituent sub-systems and to the larger systems of which it is itself a part."²⁷ He views the decision-maker as a "regulator," modifying his courses of action and criteria, when necessary, rather than an "actor" with prescribed ends and objectives. "I am particularly concerned," he states, "with the reciprocal process by which the setting of the appreciative system is itself changed by every exercise of appreciative judgment."²⁸ Vickers, in other words, views the decision-maker as a reactor rather than an actor.

26. Infra., pp. 35-57.

27. Sir Geoffrey Vickers, The Art of Judgment: A Study of Policy Making (London: Chapman and Hall, 1965), p. 22.

28. Ibid.

Vickers and Boulding,²⁹ emphasize the dynamics of mental activities and social processes in determining decision-making behaviour. Each decision, they note, depends not only on the immediate situation as it presents itself but also is conditioned very significantly by the image and sequence of past decisions, and future expectations resulting from the discourse of their thoughts and actions. These ideas appear to support Allport's "proception" concept noted in Chapter 2.³⁰ Boulding emphasizes the "consciousness" cognitive dimensions of the individual but does not deny the stimulus qualities of a situation in determining both covert and overt response patterns. He points out, it is

. . . realistic to suppose that between the incoming and outgoing messages lies the great intervening variable of the image (subjective knowledge). The outgoing messages are the result of the image, not the result of incoming messages. The incoming messages only modify the outgoing messages as they succeed in modifying the image. 31

This "image" goes beyond the boundaries of purely external phenomena but as noted above, Boulding and Vickers are both concerned with the dynamics of internal phenomena, that is the cognitive processes. They infer a "self-

29. Kenneth H. Boulding, The Image (Ann Arbor: University of Michigan Press, 1956).
30. Gordon W. Allport, "Perception, Proception and Public Health," Personality and Social Encounter (Boston: Beacon Press, 1960), pp. 301-302. See also, Infra., p. 34, ff. 38,40.
31. Boulding, op. cit., p. 38.

conscious" image of man, wherein the roles perceived by the individual both for himself and for others within his behavioural environment are significant in determining his actions. Snyder, on the other hand, tends to emphasize only the overt responses to such mental processes.

The author of this study agrees essentially with the viewpoint of Vickers and Boulding. The Snyder thesis, while helpful in emphasizing the need to consider the behavioural dimensions in decision-making, stops short of a satisfactory explanation. Vickers and Boulding appear to approach behavioural decision-making on a more comprehensive basis.

Towards a Model of Decision-Making

The concepts of cognitive behaviourism described in Chapter 2 make it possible to extend the behavioural approach of the Snyder model of decision-making to take into account specifically various psychological dimensions, namely, perceptions, attitudes, and motivations. A modified model might be erected, consisting of a decision-making network of various groups of participants as suggested in Figure 3.

The network receives messages (or stimuli) from different sources, and these are transmitted through various channels of communication from one group of participants to another. Different constraints condition the response

which each group will have to the stimulus, notably the goals sought, the nature of the institutional framework, and the perceptions, attitudes, and motivations of the individual participants. These factors, together with the authority or influence which the various groups have in the network will determine the eventual decision.

Summary

Two main approaches have been used in the analyses of decisions in the public policy field: the normative and the behavioural. In recent years there has been a shift towards the latter, especially in political science, for it is believed that more satisfactory explanations are likely to be found through the analysis of the behaviour of the participants in the decision-making process than through the study of the process itself.

Public Health officers are perhaps the most important single group of participants in decision-making relating to water quality management. It seems pertinent, therefore, to determine their perceptions and attitudes relating to water quality problems and solutions to them, and their views as to the locus of responsibility for taking action.

CHAPTER 4

THE ROLE OF PROFESSIONALS IN DECISION-MAKING

Introduction

Professionals play a variety of roles in the decision-making process. This role may be that of a technical advisor, an administrator, or a member of a pressure group. It might also be a combination of all three. Moreover, the professional is involved in various parts of the decision-network i.e. in government agencies, in industry, or in pressure groups. Of the various people involved in water management decision-making in Canada, probably none plays a more critical role than the professional. Participating either as a technical advisor or as an administrator, he influences in important ways the identification of problems, the actions chosen to deal with them, and views as to who is responsible for taking such action. A wide variety of professionals are involved in decision-making, notably engineers, biologists, medical officers, lawyers, and economists. Generally, however, particular kinds of problems are dealt with by particular kinds of professionals. Thus flood problems and problems of developing hydroelectric power, and irrigation are usually dealt with by engineers. Matters concerning the maintenance of anadromous fish runs are typically assigned to fishery biologists,

while water quality problems are allocated to sanitary engineers and medical health officers.

The view seems to have been that since water problems are typically problems requiring considerable technical expertise, they should be referred to the group of professionals that has the most appropriate expertise.¹ Based on this view, administrative structures have been established that are oriented mainly towards particular professions. For example, water rights agencies are typically staffed almost entirely by engineers, aided by a small group of lawyers, while pollution control agencies are generally staffed by sanitary engineers and natural scientists.

In his role as a technical advisor or as an administrator the professional is expected to identify the problems that need to be dealt with and has to recommend the appropriate kind of action. Inevitably his perceptions of the problems and possible solutions, and his attitudes as to his own role, and that of others, are reflected in the recommendations he makes or the action he takes. It may be, however, that there are differences between the perceptions,

1. W.R. Derrick Sewell, "The Role of Attitudes of Engineers in Water Management," in F.L. Strodbeck and Gilbert F. White, eds., Attitudes Toward Water: An Interdisciplinary Exploration (Chicago, Ill.: University of Chicago, Social Psychology Laboratory and Geography Department, unpublished manuscript, January, 1970).

attitudes, personality, and motivation of the professionals and the public whom they serve.² One result may be that actions which the public might choose if asked for their views may not be correctly perceived by the professionals. As a consequence, actions which the professional recommends may either fail to accomplish the objectives they are intended to attain or they may result in consequences which he did not predict.³

Research on the Role of Professionals in Decision-making

The role of professionals in decision-making has long been a focus of interest in sociological and psychological research. Several sociologists and psychologists have undertaken studies which have revealed that the ways in which the professionals perceive their role has an important influence on their views about the problems with which they deal.⁴ Among these Merton⁵ and Prandy⁶ have studied the

2. Gilbert F. White, "Formation and Role of Public Attitudes," in Henry Jarrett, ed., Environmental Quality in a Growing Economy (Baltimore, Md.: Johns Hopkins Press, 1966), pp. 105-127.
3. Ibid.
4. See, for example, Everett C. Hughes, Men and Their Work (Glencoe, Ill.: Glencoe Free Press, 1958); J.J. Preiss and H.J. Ehrlich, An Examination of Role Theory (Lincoln, Neb.: University of Nebraska Press, 1966); Anne Roe, The Psychology of Occupations (London: John Wiley and Sons, 1965); and Morris Rosenberg, et. al., Occupations and Values (Glencoe, Ill.: Glencoe Free Press, 1957).
5. Robert Merton, Social Theory and Social Structure (Glencoe, Ill.: Glencoe Free Press, 1957).
6. Kenneth Prandy, Professional Employees (London: Faber and Faber, 1965).

role certain professionals perceive for themselves in their jobs and in society, while others⁷ have studied the work-value orientation of different professional groups. The relationship between personality characteristics and the choice and success in particular occupations have been examined by Strong and Kuder⁸ and

7. See, for example, William V. D'Antonio, et. al., "Institutional and Occupational Representations in Eleven Community Influence Systems," American Sociological Review, Vol. 26 (June, 1961), pp. 440-446; Edmund M. Ricci, "Organizational and Professional Influences Upon Work Role Conception and Work Interaction" (Unpublished Ph.D. dissertation, University of Pittsburg, 1967); Robert Cyert and James March, A Behavioral Theory of the Firm (Englewood Cliffs, N.J.: Prentice-Hall, 1963); and Bernice T. Eiduson, Scientists: Their Psychological World (New York: Basic Books, 1962).
8. Personality and interest inventories have been constructed by those primarily concerned with vocational choice and success, for purposes of diagnosis, prediction of future behaviour, and research. Amongst the leading investigators are E.K. Strong, Jr. and G.F. Kuder. See, for example, E.K. Strong, Jr., Manual for Strong Vocational Interest Blanks for Men and Women, Revised Blanks (Forms M and W) (Palo Alto, Calif.: Consulting Psychologist's Press, 1959); E.K. Strong, Jr., Vocational Interest 18 Years After College (Minneapolis: University of Minnesota Press, 1955); E.K. Strong, Jr., and A.C. Tucker, "The Use of Vocational Interest Scales in Planning a Medical Career," Psychological Monographs, Vol. 66 (1952); and G.F. Kuder, Occupational Interest Survey General Manual: (Chicago, Ill.: Science Research Associates, 1966). Cottle provides a useful review of the research undertaken to-date evaluating both the methods of construction of personality and interest inventories and of their application to current practices, see William C. Cottle, Interest and Personality Inventories (Boston, Mass.: Houghton Mifflin Company, 1968); (The author provides an excellent bibliography of research undertaken in this field.)

others⁹ whose work in the field of vocational behaviour could offer many valuable insights to other social scientific research such as the present study undertaken. The results of these investigations seem to suggest that different occupational and professional groups can be distinguished in terms of basic personality traits and that once the worker chooses his particular vocation these traits have a significant influence on the tasks he has to perform.

Other social scientists¹⁰ have suggested that an

9. An outstanding collection of studies in the field of occupational behaviour has been brought together under one cover by Zytowski: See, Donald G. Zytowski, Vocational Behaviour: Readings in Theory and Research (New York: Holt, Rinehart and Winston, 1968). One of the purposes expressed by the author in compiling these studies was "that it was hoped that the broad sampling exercised in collecting the articles will bring not only counseling and guidance workers, but also sociologists, industrial psychologists, labor economists, personnel workers, and the like to look outside the confines of their disciplines and perhaps discover that they share interests and concerns and could learn from each other." (Zytowski, p. vi.) Its relevance to geographers and other social scientists interested in the role of professionals in various situations cannot be underestimated.
10. See, for example, A.P. Pross, "The Development of Professions in the Public Service: The Foresters in Ontario," Canadian Public Administration Journal, Vol. 10, No. 3 (September, 1967), pp. 376-404; Robert L. Kahn, Organizational Stress: Studies in Role Conflict and Ambiguity (New York: John Wiley and Sons, 1964); Robert Presthus, Men at the Top: A Study in Community Power (New York: Oxford University Press, 1964); and Herbert A. Simon, Administrative Behavior: A Study of Decision Making Processes in Administrative Organization (New York: Glencoe Free Press, 1957).

individual's views about his role are conditioned by his position in the employment hierarchy and by his identification with the agency for which he works, which is perhaps also a function of time and experience. The engineering profession has been the focus of several analytical studies exploring the types of persons involved, their goals, means, and expectations.¹¹ A number of political scientists, notably Maass¹² and Marshall¹³ have examined the role of the engineer in federal water resource programmes and have shown that views held by engineers in reference to particular water problems and solutions to them have had an important influence on public policy in the United States.

Among geographers, Sewell has studied attitudes of water resources engineers. In a recent investigation he attempted to determine ways in which consulting and government engineers perceived their involvement in decisions

11. See, for example, J.E. Gerstl and S.P. Hutton, Engineers: The Anatomy of a Profession (London: Tavistock, 1966); John Dustin Kemper, The Engineer and His Profession (New York: Holt, Rinehart and Winston, 1967); Louis B. Barnes, Organizational Systems and Engineering Groups (Boston: Harvard University Press, 1960); and the classical treatise by Hardy Cross, Engineers and Ivory Towers (New York: McGraw-Hill, 1952).
12. Arthur A. Maass, Muddy Waters: The Army Engineers and the Nation's Rivers (Cambridge, Mass.: Harvard University Press, 1951).
13. Hubert Marshall, "Politics and Efficiency in Water Development," in Allen V. Kneese and Stephen C. Smith, eds., Water Research (Baltimore, Md.: Johns Hopkins Press, 1966), pp. 291-310.

relating to water management problems.¹⁴ The results of his study confirmed evidence gathered by sociologists and others on the engineer's perception of his role and the factors which appear to influence such perceptions. It was found that engineers, most probably because of their education and training, placed a heavy reliance on technical rather than economic or social solutions to problems. It also appeared that past experience with specific problems had an important influence on perceptions of problems and that the engineers' occupational code has a significant affect on their decisions and means sought to achieve a desired end.

Studies of Public Health Professionals

Public Health officials also play an important role in decisions relating to human use and modification of the environment. Their role has been studied by various sociologists, psychologists and others. The focus of research, however, has altered significantly in the past decade. By and large, studies relating to the Public Health professional before the 1960's were generally focused on the organization (services and facilities) and technical (means

14. Sewell, "The Role of Attitudes of Engineers in Water Management," loc. cit.

and methods) aspects of the profession.¹⁵ Few systematic attempts were made to examine the Public Health professional's role in a decision-making network.¹⁶ However, in the last decade, increasing efforts are being made to explore more profoundly the roles and motivating factors of selected Public Health professionals. Numerous surveys and discussions have appeared in the various professional journals, encompassing two major themes of significance. One theme relates to the need for Public Health to accept a twentieth century challenge of environmental management. If accepted it will require a major

15. For a brief outline of the types of studies undertaken before 1960 see, Edward Wellin and Milvoy S. Seacat, "Social Science in the Health Field - A Review of Research (1954-1959)," American Journal of Public Health, Vol. 52 (September, 1962), pp. 1465-1472; and George Rosen and Edward Wellin, "A Bookshelf on the Social Sciences and Public Health," American Journal of Public Health, Vol. 49 (April, 1959), pp. 441-454.
16. A review of the three leading professional journals: American Journal of Public Health, Public Health Reports, and Canadian Journal of Public Health since 1950 reveal this tendency. Furthermore, it is reported that out of a total of 565 social science research projects in the health field during the period 1954-1959 only 4 of these were focused on the social and psychological dimensions of the Public Health professional (See Wellin, op. cit., pp. 1466-1467).

reorganization and re-evaluation of structures and policies.¹⁷ A second theme concerns the identification of the factors involved in the professional roles and image of Public Health officials.¹⁸ Illustrations of studies based on these themes include those concerning the definition of environmental health,¹⁹ the deter-

17. An indication of the scope and intent of viewpoints on this subject is reflected in the following: Leonard J. Duhl, "Environmental Health: Politics, Planning and Money," American Journal of Public Health, Vol. 58, No. 2 (February, 1968), pp. 232-257; John R. Fleming, "Environmental Management - A Twentieth Century Public Health Challenge," Canadian Journal of Public Health, Vol. 56, No. 1 (January, 1965), pp. 1-6; Sol Levine and Paul White, "The Community of Health Organizations," in Howard Freeman, et. al., eds., Handbook of Medical Sociology (Englewood Cliffs, N.J.: Prentice-Hall, 1963); and William H. Stewart, "New Dimensions of Public Health: Their Impact on the Evaluation and Selection of Health Personnel," American Journal of Public Health, Vol. 57, No. 4 (April, 1967), pp. 584-592.
18. See, for example, Mary Arnold, "Perception of Professional Role Activities in the Local Health Department," Public Health Reports, Vol. 77 (January, 1962), pp. 80-88; Luther L. Terry, "The Health Officer and Medical Care Administration," American Journal of Public Health, Vol. 54, No. 11 (November, 1964), pp. 1799-1803; Myron J. Lefcowitz, "The Public Health Professional: A Marginal Man," American Journal of Public Health, Vol. 54, No. 7 (July, 1964), pp. 1125-1128; and Hugh B. Cottrell, "The Health Officer - His Image," American Journal of Public Health, Vol. 54, No. 2 (February, 1964), pp. 255-256.
19. See, for example, K.C. Charron, "Searching Questions in Public Health," Canadian Journal of Public Health, Vol. 57, No. 12 (December, 1966), pp. 551-554; Herbert R. Domke, "Changes in Organization and Services of Local Health Departments," Public Health Reports, Vol. 78, No. 5 (May, 1963), pp. 387-392; Albert Metts, "Relationship Between Comprehensive and Environmental Health Planning," Public Health Reports, Vol. 84, No. 7 (July, 1969), pp. 647-654; and Luther L. Terry, "Environmental Health: Everybody's Business" (Paper presented at the Northwestern Conference on "Interactions of Man and His Environment," Chicago, Illinois, January 28, 1965).

mination of appropriate standards of water quality,²⁰ and the examination of the effectiveness of the means of implementing environmental quality policies.²¹ Furthermore, attention is being directed toward such factors as training, experience, values, perceptions, attitudes, and personality dimensions of Public Health officials, as well as towards the external constraints that affect them in carrying out their tasks.

The literature devoted to the job analysis of Public Health workers is characterized by information gathered on such topics as to what the Public Health worker does, his training and experience, his working relationship with

20. See, for example, Walter A. Lyon, "Water Quality Standards: Progress and Problems of Implementation," American Journal of Public Health, Vol. 58, No. 2 (February, 1968), pp. 348-352; A. Wolman, "Concepts of Policy in the Formulation of So-Called Standards of Health and Safety," Journal of the American Water Works Association, Vol. 52, No. 11 (November, 1960), pp. 1343-1348; and William H. Crandall, "Water Supply and Sewage Disposal in a Small Community," Canadian Journal of Public Health, Vol. 54, No. 7 (July, 1963), pp. 317-321.
21. See, for example, Herbert J. Dunsmore, "Criteria for Evaluation of Environmental Health Programs," American Journal of Public Health, Vol. 54, No. 1 (January, 1964), pp. 7-10; Lee Holder and O.L. Deniston, "A Decision Making Approach to Comprehensive Health Planning," Public Health Reports, Vol. 83, No. 7 (July, 1968), pp. 559-568; L.J.H. Burton, "Health Education and the Culture of Communities," in W. Hobson, ed., The Theory and Practice of Public Health (London: Oxford University Press, 1961), pp. 336-342; and G.H. Bonham, "Health, Money and Confusion," Canadian Journal of Public Health, Vol. 56, No. 2 (February, 1965), pp. 61-64.

persons both internal and external to his agency, and his personal feelings about his role in the profession. A significant long-term research project conducted by a team of researchers under U.S. federal government sponsorship, generally referred to as the Yale Study, attempts to encompass most of these lines of enquiry. Parts of this study have been completed and reported upon. This study, although initiated in the mid-1950's, provides an invaluable framework as to the types of information needed, methods of study, and objectives of such research for the direction of research today.

One method used for studying what the Public Health worker actually does in his daily tasks has been to study the functional distribution of working time over a specified period.²² Due to the complex of activities performed by Public Health services, and the difference in responsibilities of the Medical Health Officer and the Public Health Inspector, environmental health is a much more minor concern of the administrator (Medical Health Officer) than it is for

22. See, E.M. Cohart, W.R. Willard and W. Hiscock, "A Method for Studying the Public Health Worker and His Job - The Yale Study," Public Health Reports, Vol. 70, No. 5 (May, 1955), pp. 447-452; E.M. Cohart and W.R. Willard, "A Time-Study Method for Public Health - The Yale Study," Public Health Reports, Vol. 70, No. 6 (June, 1955), pp. 570-576; E.M. Cohart and W.R. Willard, "Functional Distribution of Working Time in Five County Health Departments," Public Health Reports, Vol. 70, No. 7 (July, 1955), pp. 713-719; and E.M. Cohart, et. al., "Experience of Public Health Workers," Public Health Reports, Vol. 70, No. 11 (November, 1955), pp. 1116-1124.

the specialist (Public Health Inspector). The time spent on water pollution and other sanitation activities by these personnel was reported in one study to vary 14.4 percent and 90.8 percent (of total time) respectively.²³ The training and experience of Public Health professionals has provided the focus for numerous studies. Their experiences in fields outside Public Health, their reasons for entering Public Health, and the characteristics of their Public Health experience, for example, have been studied in depth by the Yale Study Group.²⁴ The qualifications and personality characteristics of those who enter the profession have been viewed by Rosenfeld,²⁵ Coker,²⁶ and

23. See, for example, J.A. Milne, et. al., "Time Study of Public Health Activities in Mississippi," Public Health Reports, Vol. 68, No. 4 (April, 1953), pp. 378-390; and Cohart and Willard, "Functional Distribution of Working Time in Five County Health Departments," loc. cit. The distinction between the duties and responsibilities of the Medical Health Officer and Public Health Inspector, the "generalist" and the "specialist", particularly as it relates to British Columbia, are noted in Chapter 1 (including Appendix A) and discussed in Chapter 5.

24. Cohart, et. al., "Experience of Public Health Workers," loc. cit.

25. L.S. Rosenfeld and M.E. Altenderfer, "Physicians in Public Health," Public Health Reports, Vol. 70 (April, 1955), pp. 384-392.

26. Robert Coker et. al., "Public Health as Viewed by the Medical Student," American Journal of Public Health, Vol. 49, No. 5 (May, 1959), pp. 601-609.

others.²⁷ These studies have tried to determine, for example, the reasons why medical students do or do not enter the field of Public Health and why some officials ultimately leave the field and take up another career.²⁸ Coker, points out that Public Health has a low prestige rating when considered among the more traditional medical occupations and that few medical students show any inclination toward the pursuit of full-time Public Health work.²⁹ Furthermore, Romani, has suggested that the conflict and value differences which arise among Public Health personnel and which appears to detract from a strong binding sense of professionalism is due to the diverse nature of the non-Public Health background and primary training of these profes-

27. See, for example, R. Miles, L.W. Porter and J.A. Craft, "Leadership Attitudes Among Public Health Officials," American Journal of Public Health, Vol. 56, No. 12 (December, 1966), pp. 1990-2005; Ray H. Elling and W. P. Shepard, "A Study of Public Health Careers: Hospital Administrators in Public Health," American Journal of Public Health, Vol. 58, No. 5 (May, 1968), pp. 915-929; Kurt Back, et. al., "Public Health as a Career in Medicine," American Sociological Review, Vol. 23, No. 5 (1958), pp. 533-541; and Margaret A. Howell, "Personal Effectiveness of Physicians in a Federal Health Organization," Journal of Applied Psychology, Vol. 50, No. 6 (1966), pp. 451-459.
28. See, for example, Irwin M. Rosenstock and Arthur P. Miller, "Why Some Sanitary Engineers Leave the Field," Public Health Monograph No. 21, Public Health Service Publication No. 359 (Washington, D.C.: U.S. Government Printing Office, 1954).
29. Coker, loc. cit.

sionals.³⁰ A pertinent question then arises, has the Medical Health Officer consciously relinquished the higher prestige levels of his occupation in favour of Public Health work, or is he satisfied with the status he achieved in previous pursuits and therefore willing to assume a less-prestigious position as he grows older, or moreover, is the Public Health professional a "non-status" seeker? The implications of any one of these dimensions might be significant in determining both the covert and overt behavioural characteristics of these decision-makers.

The professional in Public Health tends to view himself not so much a Public Health professional but rather a member of some other primary professional group, such as medicine, who just happens to be practicing his profession within the context of Public Health.³¹ Myron Lefcowitz, for example, refers to him as a "marginal man" because he appears to straddle two or more professional fields simultaneously. As a consequence it is suggested that the values which he imposes and transforms within the Public Health system provide a unique professional role.³²

30. John H. Romani, "Politics, Professionalism and the Environment: The Administration of Public Health Services," in Lynton K. Caldwell, ed., Environmental Studies (Bloomington, Ind.: Institute of Public Administration, Indiana University, 1967), Vol. 3, pp. 1-21.
31. Rosenfeld and Altenderfer, loc. cit.
32. Lefcowitz, loc. cit.

Furthermore, there is evidence that the shift into the Public Health profession may be due more frequently to the rejection of the original career lines than to the positive pull of Public Health. In one study it was reported that the average Public Health professional entered Public Health with seven years experience in other fields, with medical and sanitation personnel having the most experience outside Public Health. Moreover, over half the physicians were previously employed in private practice.³³ Chance and personal contacts, rather than work content or education and training were main reasons for entering the Public Health field.³⁴ However, another research project focussing on the Public Health Inspector reports that in the field of sanitation engineering, applicants are more constrained by the availability and awareness of job openings rather than the prestige elements of the field.³⁵ A recent study on the Public Health Inspection profession in Canada discusses the present professional training and responsibilities of Public Health Inspectors noting such

33. E.M. Cohart and Ira V. Hiscock, "A Profile of the Public Health Worker," American Journal of Public Health, Vol. 45, No. 12 (December, 1955), pp. 1525-1532.

34. Back, op. cit., p. 532.

35. See Rosenstock and Miller, loc. cit.

characteristics as professional membership involvement, previous occupations, and distribution of working time among specific environmental health tasks.³⁶ The research team compiled a systematic list of practical "inferences" suggested by their findings. They concluded, for example, that the problems challenging the Public Health Inspector at the present and in the future would not be met if current education and training facilities were not re-evaluated and re-organized. The need for theorists and practitioners who are highly educated, suitably motivated, and capable is clear, particularly if Public Health Officers are to meet the requirements placed on them by professional involvement in human ecological issues.

The leadership and innovative qualities of Public Health professionals have been studied by several sociologists and psychologists. One study found that specific groups, such as Public Health officials, business executives and administrators of other government agencies, possessed certain strong yet similar leadership and administration qualities,³⁷ and that training and other personality variables accounted largely for variations in the degree of innovativeness among Medical Health Officers.³⁸

36. A.S. O'Hara et. al. Environmental Health Study - Public Health Inspectors, Canadian Public Health Association Project 605-7-369, 1968 (Unpublished manuscript).

37. See, for example, Miles, Porter, and Craft, loc. cit.; and W.E. Grasham, "Leadership in Administration," Canadian Journal of Public Health, Vol. 56, No. 2 (February, 1965), pp. 54-60.

38. Marshall H. Becker, "Predictors of Innovative Behavior Among Local Health Offices," Public Health Reports, Vol. 84, No. 12 (December, 1969), pp. 1063-1068.

There have been studies of the ways in which Public Health personnel perceive their role and that of others in decision-making.³⁹ They concluded that sufficient ambiguity exists in the perceptions of Public Health workers regarding the responsibilities for decision-making to constrain the effectiveness of implementing both internal and external policies. Rosen, for example, suggested that the existence of conflict and overall lack of communication between the Medical Health Officer and his medical colleagues practicing in other fields, was a function of their perception of the role of Public Health which in turn was a function of individual interests, values and job responsibilities.⁴⁰ Other in-depth studies have been undertaken by Romani⁴¹ and Sox.⁴² The former study reveals that although the Public Health Officer was considered the ultimate

39. See, in particular, Mary F. ARNOLD, "Perception of Professional Role Activities in the Local Health Department," Public Health Reports, Vol. 77, No. 1 (January, 1962), pp. 80-88. See also Allan W. Freeman, Five Million Patients: The Professional Life of a Health Officer (New York: Scribner's, 1946).

40. George Rosen, "Some Substantive Limiting Conditions in Communication Between Health Officers and Medical Practitioners," American Journal of Public Health, Vol. 51, No. 12 (December, 1961), pp. 1805-1816.

41. John H. Romani, "How Public Health Administrators Perceive Their Constituencies," Public Health Reports, Vol. 83, No. 3 (March, 1968), pp. 239-244.

42. Ellis D. Sox, "The Local Health Officer - His Job," American Journal of Public Health, Vol. 54, No. 2 (February, 1964), pp. 249-254.

manager and leader of local Health Units, these top administrators held varying perceptions as to whom they were administrating. These differences were of three orders: some felt that their clientele was comprised of the public at large, others considered only those who have been or would be, directly affected by the work of the Health Unit, while still others held the view that it was the Health professionals themselves who were most directly affected by their department's work. Differences in professional training, experience and identity were offered as partial explanations for these differences. However, they were not thoroughly explored.

Sox attempts to summarize the roles demanded of the Public Health Officer in carrying out his routine activities and infers a man of ideal and almost superhuman qualities. He describes the Public Health Officer as the

. . . 'family doctor of the community' - which is his patient; that he practices his art and science in a way that can be compared with that of the private physician in diagnosing and treating individual patients; that the health officer is a specialist in medicine and in administration, but a 'generalist' because of the broad scope of his programs; that he utilizes all of the patient's resources in relation to his needs; that he must be imaginative and practical, a listener, yet one who speaks out on controversial issues; a leader, but one who can wait for the propitious moment to arise or be created for the development of needed services; that he is an expert and an authority in his field but not authoritarian

in his dealings with his associates or with others in the community; that he is one who prods and is prodded to the end that he may fulfill his obligations to help, his patient - the community - acquire and utilize those resources that the patient needs for the prevention of disease and disability, for the prolongation of life, and for the promotion of physical and mental health. 43

Such is the professional assigned the primary responsibility for Public Health decision-making in the field of environmental health.

In summary, previous research has provided some valuable insights into the ways in which Public Health officials view their role in dealing with problems faced by society. For the most part such research has focussed upon various background characteristics, training, experience, etc. There has been only limited investigation of their perceptions and attitudes relating to water quality management, and the extent to which these views appear to influence decision-making. These latter considerations provide the focus for the present study.

43. Ibid., p. 254 (emphasis added).

CHAPTER 5

THE ROLE OF PUBLIC HEALTH IN WATER QUALITY MANAGEMENT

IN BRITISH COLUMBIA

Introduction

Basically, two alternative approaches might be used in studying the role of perceptions and attitudes of professionals in decision-making in water quality management. One would be to trace the influence of the views of various groups on a particular decision by examining the different parts of the decision-making network. This might be termed the case-study approach. An illustration would be an in-depth study of a decision relating to pesticides in a particular area or a decision concerning fluoridation in a certain city, identifying the various pressure groups, administrative agencies, technical advisors, politicians and others involved and the roles which they appear to play at different points of the decision process.

An alternative approach would be to consider the role of a particular group in decisions relating to a given problem or area of interest. Thus one might study the influence of the perceptions and attitudes of engineers or a particular pressure group on a decision concerning the installation of a sewage disposal system.

The latter approach has been selected for this study. It is focussed upon the perceptions and attitudes of Public Health officials relating to problems of water quality management. To put the study into perspective it is important to identify the problems with which these officials are concerned, and to describe the decision-network within which they play their roles as administrators, advisors, and decision-makers.

Water Quality Management Problems in British Columbia

Water quality management problems in British Columbia have given rise to relatively little public concern until recently, and even now it is difficult to identify problems which might be described as province-wide.¹ For the most part such problems are local in nature and few of them have

1. Various reviews of water quality management problems have concluded that such problems are mainly local in nature. See, for example, C.J. Keenan, "A Review of the Progress in Water Pollution Abatement in British Columbia," Background Paper B6-1, National Conference on Pollution and On Environment (Montreal, P.Q.: Canadian Council of Resource Ministers, 1965); and Gordon Ritchie, "700,000 Lost Work Days," Victoria Times, January 13, 1967, p. 17.

reached the stage where they have become issues.² It seems, however, that various forces are now at work within the economic and social systems which are likely to result in various water management problems in British Columbia becoming major public issues. These forces include burgeoning population, expanding urbanization, increasing industrialization, and continuing technological advance, on the one hand, and the impact of communications media, on the other. A consequence has been the adoption of water quality management as an important item of public policy.

Water quality problems - or as they are more popularly known, pollution problems - have grown considerably both in magnitude and in their geographic incidence in British Columbia in the past two decades. Before 1960 water quality problems seem to have been confined largely to the over

Mainland Region.³ Principally these problems concerned the

2. Sewell has suggested the water quality management problems range from minor disturbances in the environment which have little or no human consequences, to serious disturbances which threaten to impair the physical, economic, or mental health of the community. See W.R. Derrick Sewell, The Contribution of Social Science Research to Water Resources Management in Canada, Special Study No. 5, Science Secretariat, Privy Council, Ottawa, July, 1968, p. 121.
3. A review of leading newspaper coverage in British Columbia related to water pollution before 1960 revealed that only thirty-one articles made reference to the matter from March 1919 to July 22, 1959. See, for example, "Standards for Purity of B.C. Water Urged," Vancouver Sun, April 19, 1956, p. 23; and "Board Seeks Wider Control of Pollution," Vancouver Province, November 22, 1956, p. 18.

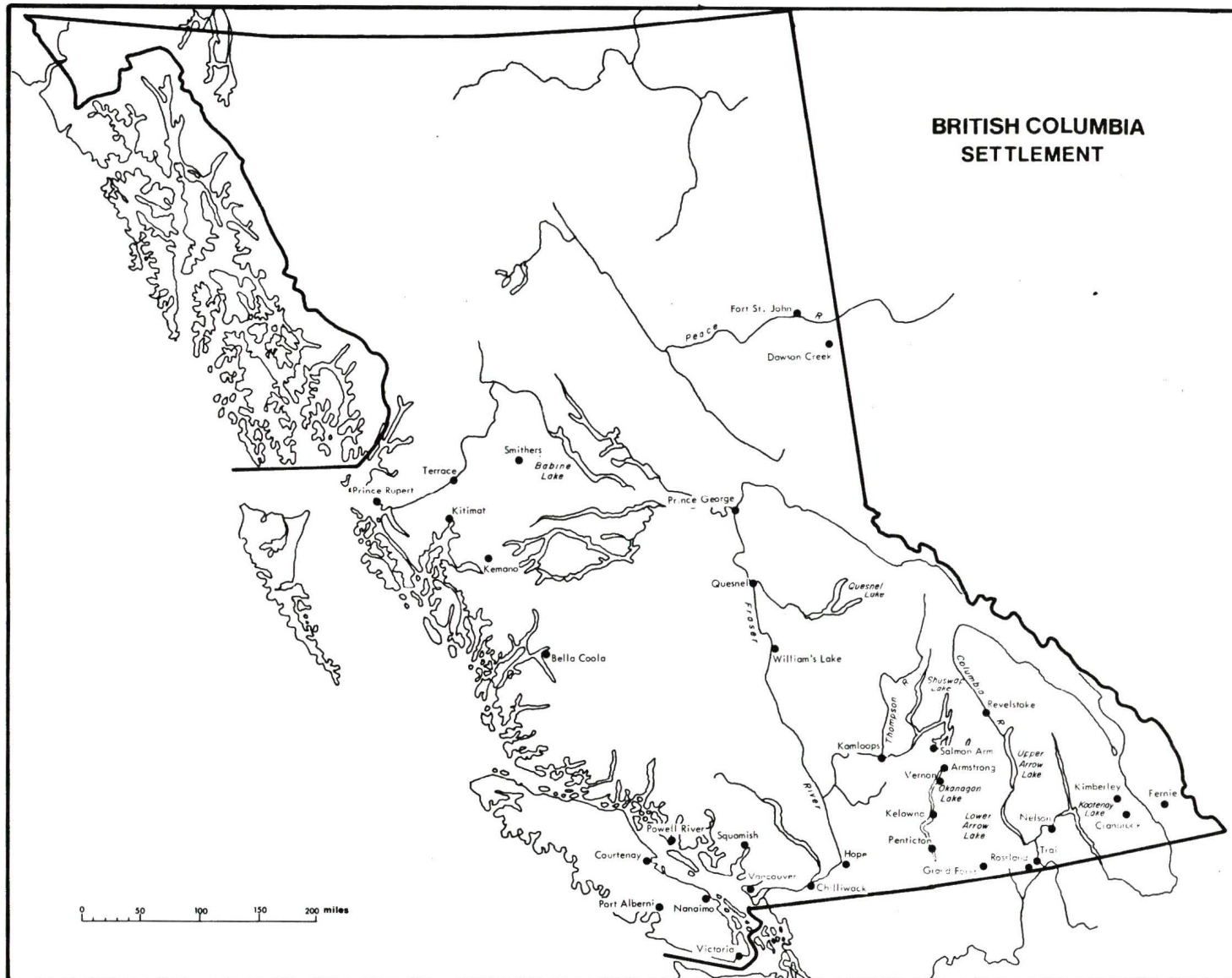
disposal of domestic sewage. Public concern over the matter resulted from pollution of English Bay, one of Vancouver's most popular bathing beaches (see Figure 4). There were warnings of health hazards,⁴ and expressions of displeasure at the decline in its aesthetic qualities.⁵ There was little expression of concern about other water quality problems, such as the effects of the disposal of industrial effluents or pesticides.

Dramatic changes, however, have occurred in the past decade, and especially in the past two or three years, in public concern about water quality problems in British Columbia. In some parts of the province pollution problems have reached the stage where they have become issues, and there are strong demands for government action to deal with them.

Water Quality problems in British Columbia have arisen from two major sources of pollution: the disposal of domestic sewage and the disposal of industrial effluents. The lack of municipal sewage treatment and disposal facilities has resulted in serious deterioration of the quality of water surrounding and serving the Greater Vancouver

4. "M.H.O. 'Well Aware' of Water Condition," Vancouver Province, April 22, 1957, p. 4.
5. "Water Polluted at City's Beaches," Vancouver Province, January 25, 1957, p. 1.

FIGURE 4



and Greater Victoria regions,⁶ as well as in several Okanagan and Kootenay cities.⁷ The problems of outfalls and insufficient treatment for these discharges are the principal contentions in these cases. A \$50 million treatment plant and tunnel complex was built to counteract some of Vancouver's problems but already it appears to have outgrown its capacity to deal with them.⁸ The issue in Victoria is not only one of the effects of a direct sewage outfall off Macaulay Point but also one of constructing a sewer system in the outlying areas where

6. Several well-researched series have appeared in the leading Vancouver and Victoria newspapers in recent years. See, for example, various articles by John Mika, Victoria Times, August 15-September 23, 1968; Gordon Ritchie, Victoria Times, January 3-14, 1967; and Arnie Meyers, Vancouver Sun, August 11-September 15, 1965.

7. An intense debate covering pollution in the Okanagan and Kootenay regions of British Columbia is reported in the provincial newspapers during the summer months of 1968. The controversy experienced an upsurge in interest in 1969 and the British Columbia government announced plans to study the problem. See, "Okanagan Lake Probe Set, Experts Issue Algae Warning," Vancouver Sun, July 27, 1968, p. 1. See also, Report of the Technical Committee of the Okanagan Watershed Pollution Control Council, May 4, 1966 (Unpublished manuscript).

8. Keenan, loc. cit.

the need for such has become critical.⁹ Protracted studies have explored these problems and recommendations for their solutions have been presented.¹⁰ However financial feasibility remains the limiting factor.

The federal government in co-operation with the provincial departments announced plans in the spring of 1969 for a five year study programme in the Okanagan area that will deal not only with water quality management but will attack the problems of water management on a more comprehensive scale.¹¹ A major development that will help to forestall many major domestic sewage problems in British Columbia took place in 1968 when the Provincial Department of Health handed down policy aimed at ensuring that all major cities and municipalities provide at least secondary treatment for their local sewage disposal.¹²

9. See, T.W. Loney, "Pollution and Planning in Victoria, B.C.," in W.J. Maunder, ed., Pollution (Victoria, B.C.: University of Victoria Evening Division, 1969), pp. 81-86; and M.A.M. Bell, "Waste Management and Environmental Quality in Victoria, B.C.," in W.J. Maunder, ed., Pollution (Victoria, B.C.: University of Victoria Evening Division, 1969), pp. 87-103.
10. See, for example, Associated Engineering Services, Ltd., Sanitary Sewerage Study of the Greater Victoria Area, Victoria, B.C., 1966. A more recent study has been conducted on the condition of the Lower Fraser River as it relates to the sewage disposal of communities bordering its waterway.
11. "B.C. - Canada to Co-operate in Water Study," Vancouver Province, October 30, 1969, p. 35.
12. "Loffmark Gets Touch on Pollution," Vancouver Sun, September 27, 1968, p. 14.

The water problems associated with industrial effluents are gaining prominence in many areas. Wastes from mines, pulp mills, food processing plants and integrated smelter operations are among the major problems in this connection. Mine wastes are of an intermittent nature causing discolouration of water, affecting fish life and in some areas recreational and domestic water supplies. Up until the mid-1960's pulp mills in British Columbia were located mainly along the coastline and no real problems existed because of the adequate diluting capacity of marine waters. The toxic effluents resulting from the various chemical processes required for the manufacture of pulp and paper were carried away with the tides.¹³

13. "A fully bleached kraft mill producing 1,000 tons of pulp per day discharges about sixty million gallons of effluent per day. The effluent from a modern mill has a 5-day BOD of 35 lbs. per ton of pulp produced. Thus, the oxygen demand exerted by a 1,000-ton per day mill is equivalent to that of a city of 206,000 people. In addition to its oxygen demand which without adequate dilution, dispersion and aeration could cause the effluent to deplete the dissolved oxygen in receiving waters to a level which would not sustain fish, the wastes are toxic to fish. Various workers have demonstrated that bleached kraft wastes are pronounced toxic to a salmonid fish, their eggs and alevins at dilution ratios of less than 20 to 1. Some of the components such as hydrogen sulfite, methyl mercaptan, sodium thiosulphate and fatty and resin acid soaps are individually lethal to fish during short exposure periods at concentrations of 5 parts per million and less. The wastes from calcium base sulfite mills and bleached kraft mills are very acidic. Those from unbleached kraft mills are highly alkaline, and salmonid fishes cannot tolerate ranges in pH, much beyond the limits of 6.7 to 8.5". See R.E. McLaren and K.J. Jackson, "Water Pollution and Fisheries," in Anthony De Vos, et. al., eds., The Pollution Reader (Montreal, P.Q.: Harvest House, 1968), p. 122.

BOD
Biological
Oxygen
Demand

However, over the last few years plans for establishing twelve to twenty pulp mills along inland waterways such as the Fraser, which is one of the world's greatest salmon producing rivers, have been announced. To-date three mills are in full operation in the Prince George area on the north end of the Fraser, and one in Kamloops located on the Thompson River. The three mills at Prince George use the Kraft sulphite process and in May, 1969 controversy broke out as to the quality of their discharged wastes, particularly at one of these plants, since all purported to have the best in-plant waste recovery methods available. One tidal pulp mill located at the head of a long inlet on the west coast of the mainland is periodically creating concern with fisheries authorities over the measured biological oxygen demand (BOD) in the surrounding waters and the deposition of fibre on the sea bottom.¹⁴

14. "In addition to the dissolved substances responsible for the toxicity and oxygen demand of pulp-mill wastes, they are also sources of large amounts of organic particulate matter. If hydraulic debarking of logs is practised, a substantial load of very small bark particles joins the fiber lost in the screening of pulp and arrives in the mill effluent. These particles usually settle out to form sludge beds which blanket the bottom, rendering it incapable of sustaining bottom-dwelling fish food organisms, and in addition bacteria decompose the sludge deposits producing toxic hydrogen sulfide gas, methane gas and a zone of dissolved oxygen depletion". McLaren and Jackson, loc. cit. For an outline of water quality parameters used as guidelines in British Columbia by Public Health Officials, see Appendix B).

Food processing plants may cause, from time to time, localized water quality problems, due to the lack of appropriate waste reduction facilities. However, most plants appear to be reducing waste loadings through treatment processes up to ninety percent. Fortunately also, food processing in British Columbia is not concentrated in large plants but is fairly well distributed in small establishments throughout the Province (in the primary product producing areas). However, as population and urbanization accelerate and centralize, industry will become more concentrated and the problems of pollution may well increase in intensity.

Particularly serious problems of water pollution have resulted from effluent discharges from the industrial complexes at Trail and Kimberley.¹⁵ Kimberley is the location of the largest lead-zinc-iron and silver ore mine in the Commonwealth. The problem arises from a subsidiary fertilizer plant which discharges 1,100 tons of gypsum daily into the water supplies of neighbouring communities which via a creek and river eventually flows into the seventy mile long Kootenay Lake. What was once a favorite trout fishing river in the area ceases to have any fish at all.¹⁶ Algae are starting to flourish rapidly in the lake itself.

15. Keenan, loc. cit.

16. Keenan, loc. cit.

Although the industries have tried to eliminate the problem by constructing settling ponds for their wastes, the fish still do not run in the St. Mary River, and the pollution problem on Kootenay Lake is being perpetuated by discharging domestic and industrial pollutants from communities and plants along its shoreline.¹⁷

The Development of Water Quality Management
in British Columbia

Historically, problems of water quality management in Canada have been placed mainly in the hands of provincial governments. For the most part Public Health Departments have assumed the dominant role in dealing with these matters. These tendencies have resulted in part from interpretations of the British North America Act of 1867,¹⁸ and from the traditional association of water quality with problems of disease.¹⁹ Although the federal government

17. See, "East Kootenay Health Unit Annual Report, 1968" and "West Kootenay Health Unit Annual Report 1968" for statistical summaries of the sources and degree of water deterioration in these areas.
18. See, for example, Bora Laskin, "Jurisdictional Framework for Water Management," Background Papers, Resources for Tomorrow Conference (Ottawa: Queen's Printer, 1961), Vol. 1, pp. 211-225; Dale Gibson, "The Constitutional Context of Canadian Water Planning," Background Paper A3-1, Canadian Council of Resource Ministers, Water Workshop Seminar, Victoria, B.C., October, 1968, pp. 106-129; and Dale Gibson, ed., Constitutional Aspects of Water Management, Research Reports No. 2 and No. 3 (Winnipeg, Man.: University of Manitoba Agassiz Center for Water Studies, 1968-1969).
19. See Abel Wolman, Water, Health and Society, (Bloomington, Ind.: Indiana University Press, 1969).

assumed some general responsibilities for the welfare of the nation under a number of clauses of the Act,²⁰ specific responsibilities for the health of its citizens appear to have been assumed by the provinces. Sanitation in particular seems to have been a matter for which the provinces rather than the federal government have assumed major responsibility.²¹

Health considerations have been by far the major factor in public policy relating to pollution in Canada. This is reflected particularly in the laws which have been enacted to deal with pollution. Certainly in the early days

20. Federal and provincial responsibilities for the public health were not clearly defined by the British North America Act, 1867 except as it concerned quarantine and health institutions, Sect. 91 (11) gives the Federal government the duties relating to "Quarantine and the establishment and maintenance of Marine Hospitals," whereas Sect. 92 outlined the powers of Provincial legislatures in terms of: (7) "The establishment, maintenance, and management of hospitals, asylums, charities and eleemosynary institutions in and for the Province, and other than marine hospitals," (8) "Municipal institutions in the Province"; and (16) "Generally all matters of a merely local or private nature in the Province." See The British North America Act, 1867 (30 & 31 Victoria, C. 3).

21. See various papers presented at the National Conference on Pollution and Our Environment (Montreal, P.Q.: Canadian Council of Resource Ministers, 1965), in particular, A.E. Berry, "Environmental Pollution and its Control in Canada - A Historical Perspective," Background Paper A-1: "The Participation of the Government of Canada in the Investigation and Abatement of Water Pollution," Background Paper B5-1; and Keenan, loc. cit.

of Confederation, and in many parts of the country even today, few other factors played a significant role in shaping such policy.

A desire to combat problems of pollution was expressed early in the history of the province of British Columbia. In 1893, when the population of the province was only 98,000, an Act Respecting Public Health was passed.²² A Board of Health was established, consisting of a panel of five members appointed by the Lieutenant Governor-in-Council. The Chairman of the Board was also the Chief Health Officer of the Province. The Board's main functions were to set out and enforce health standards and to inform the public of the state of sanitary conditions in the province.

The operations of the Department of Health depended upon (and still do) municipal co-operation (see Table 1). Sanitary police and a local Board of Health were required in the municipalities and the Board had rights to enforce the employment of a Medical Health Officer in areas if the need was sufficient. Through these means the Board could check and have close contacts with developments in various areas. Plans of sewers and water systems were required to

22. Province of British Columbia, Health Act, 1893, 1893, C. 15. For an excellent discussion of the history and development of Canadian Public Health services and organization, particularly in reference to the progress of British Columbia's institutional framework since the early 1900's see Harry M. Cassidy, Public Health and Welfare Organization in Canada (Toronto: Ryerson Press, 1945).

TABLE 1.

FUNCTIONS OF WATER POLLUTION CONTROL AGENCIES IN BRITISH COLUMBIA
AND ENABLING LEGISLATION

PROVINCIAL									
FUNCTIONS	AGENCY	Dept. of Municipal Affairs	Dept. of Municipal Affairs	Dept. of Lands, Forests and Water Resources	Dept. of Lands, Forests, and Water Resources		Dept. of Recreation and Conservation	Dept. of Agriculture	Department of Health
	LEGISLATION		Special Sewerage and Drainage Districts		Improvement Districts	Pollution Control Branch			
		Municipal Act, 22, 1960	Sewerage and Drainage Districts Special Acts, 24, 1960	Dept. of Lands, Forests and Water Resources Act, 1960	Water Act, 4, 1960	Pollution Control Act, 1967	Recreation and Conservation Act, 1960	Soil Conservation Act, 18, 1960	Health Act, 1960
Overall Planning		*	*	*	*	*			
Investigation		*	*	*	*	*			
Construction		*	*		*				
Operation		*	*		*				
Financial Assistance		*	*		*				
Basic Data Collection		*	*	*	*	*	*		*
Regulation		*	*	*	*	*	* ¹	* ¹	* ²

Table 1 (cont'd.)

**FUNCTIONS OF WATER POLLUTION CONTROL AGENCIES IN BRITISH COLUMBIA
AND ENABLING LEGISLATION**

FEDERAL												
FUNCTIONS	AGENCY	Dept. of Energy Mines and Resources	Dept. of Transport	Dept. of National Health and Welfare	Dept. of Fisheries	Dept. of Indian Affairs and Northern Develop- ment	Dominion Bureau of Statistics	Central Mortgage and Housing Corporation	Municipal Development Loan Board	National Research Council	National Harbours Board	International Joint Commission
	LEGISLATION	Resources and Techni- cal Surveys Act, 1, 1966 Canada Water Conserva- tion Assistance Act, 1952 International River Improvements Act, 2, 1955	Canada Shipping Act, 1952	Dept. of National Health and Welfare Act, 1952	Fisheries Act, 1952	National Parks Act, 12, 1952 Migratory Birds Con- vention Act, 1952	Statistics Act, 1952	National Housing Act, 1960	Municipal Development and Loan Act, 1963	Research Council Act, 1952	National Harbours Act, 21, 1936	Boundary Waters Treaty, 1909
Overall Planning												
Investigation	*		* ³	*								*
Construction						*						
Operation			* ³			*						
Financial Assistance	*							* ⁵	* ⁴			
Basic Data Collection	*		* ³	*			*			*		
Regulation	*	*	*	*		* ⁴					*	*

¹ Although permits concerning the discharge of effluents in the province are issued by the Director of the Pollution Control Branch, within 10 days after receipt of an application for a permit, the Director must forward copies of the application to the Deputy Ministers of Recreation and Conservation, Agriculture, and Health, and to the Comptroller of Water Rights.

² Under the terms of the recent Pollution Control Act, no action can be taken under Sections 24, 26 or 27 of the Health Act without the authority in writing of the Director of the Pollution Control Branch. Within 10 days after receiving an application for a permit, however, the Director must forward a copy of the application to the Deputy Minister of the Department of Health.

³ Undertakes river pollution studies upon government request.

⁴ Regulations to prevent pollution of waterfowl habitat.

⁵ Loans to municipalities for sewage treatment plants.

Source: The Administration of Water Resources in Canada (Montreal, P.Q.: Canadian Council of Resource Ministers, 1968).

be presented to the Provincial Board for examination of methods and possible effects. The Provincial Board of Health had power to take direct legal action in the case of failure to meet its demands.²³ These principles and basic framework remain in practice today.

The first Health act in British Columbia was considered highly successful, but amendments were made as situations arose. In 1897, specific legislation on sewage was passed to control the outflow of untreated effluent.²⁴ However, it was not until the 1960's that British Columbia's two largest metropolitan areas, Vancouver and Victoria, approached any large scale treatment of sewerage effluent and even today their facilities are being proven outgrown and inadequate. A clause in the Health Act, 1897 states that "no common sewer or system of sewage shall be established or continued unless there is maintained in connection therewith, a system of sewage purification and disposal which removes and avoids any menace to public health."²⁵ With this clause and other succeeding sections of the Act, the provincial government began to maintain tighter control of the ways and means of waste disposal schemes. The concept of pollution, how-

23. Health Act, 1893, 1893, C. 15, S. 27 (3) states as follows: "No sewer, or appliance for the ventilation of the same, shall be constructed in violation of any of the principles laid down by the Provincial Board of Health, subject to appeal to the Lieutenant-Governor in Council."

24. Province of British Columbia, Health Act, 1897, 1897, C.A. 1888, C. 55.

25. Health Act, 1897, 1897, C. 91, S. 24(3).

ever, was still considered with respect to man's physical health and specifically to the direct effects of pollutants on his well being.

British Columbia's first and only anti-pollution legislation before 1956 which was not contained in the Health Act, was incorporated in the Water Act in 1934. Section 20 states that "every person is guilty of an offense against this Act who puts into any stream (lake, river, creek) any sawdust tailings, gravel, refuse or other material or substance of any kind after being ordered by the engineer not to do so."²⁶ This is a rather flexible clause but it does distinguish pollution as more than a mere health problem. The impacts of pollution on Man's recreational and economic activities appear to be appreciated in this legislation.

As the province developed industrially and grew in population, demands for pollution control increased. In February 1954, for example, N.J. Goode (a Health engineer for the Department of Health) and P.A. Larkin (a fisheries biologist) proposed a provincial pollution control agency.²⁷ In 1956, British Columbia enacted specific pollution control legislation.²⁸ A Pollution Control Board was established

under the chairmanship of the Deputy Minister of Municipal

26. Province of British Columbia, Water Act Amendment Act, 1934, 1934, C. 69, S. 20.

27. Victoria Daily Times, February 29, 1954, p. 15.

28. Province of British Columbia, The Pollution-control Act, 1956, 1956, C. 36.

Affairs. The Director of the Division of Public Health Engineering was nominated Secretary and Executive Engineer of the Pollution Control Board. The Board was not self-contained, however, as staff and services were found in the various related departments. In 1965, amended legislation transferred the responsibility for administration of the Board to the Minister of Lands, Forests and Water Resources. The Chairman of the Board was to be the Deputy Minister of Water Resources.²⁹ This legislation enabled the Pollution Control Board to hire its own staff of engineers, technicians and secretarial help. The Pollution Control Act controls 366,000 square miles of the province or forty-five percent of the total land area which contain ninety-five percent of the population.³⁰ The entire province was not placed under the control of the Board because of the lack of staff in remote areas and because pollution problems in such areas were not generally extreme. Control in the areas outside the jurisdiction of the Pollution Control Board is maintained primarily by the Health and Water Acts. Various other departments and agencies with their pursuant legislation have limited responsibilities in water quality management (Table 1).

29. Province of British Columbia, Pollution Control Act, 1967, 1967, C. 34, S. 18.

30. Keenan, loc. cit.

The establishment of the Pollution Control Board was a major step towards solving many of the province's pollution problems. Although no single reason can be cited for the creation of such an agency the shift of power from many separate departments to one established authority can be attributed to widespread recognition of the growing complexity of the issue. A regional, rather than a local, approach involving all the resources affected was seen to be essential for a successful scheme. The seven members of the original Board (1956) were authorities on such subjects as fisheries, wildlife protection, forestry, water resources, mining, agriculture, health, and finally the public interest. Recently three more members have been appointed to the Board because of the demand for more influence, especially on the public interest level. The Board is charged with powers and duties to determine what constitutes pollution, to prescribe standards, to conduct surveys, to investigate existing and proposed means of waste disposal, to call for correction of unsatisfactory situations and to appoint advisory or technical committees to investigate special problems.³¹ The Act gives the Board powers of prosecution for failure to comply with its standards. The maximum fine at present is one thousand dollars

31. Pollution Control Act, 1967, 1967, C. 34, S. 4.

basic and up to \$500 per day for each day a violation continues. This is a great contrast to the maximum penalty of ten dollars per day imposed for evasion of the requirements of the 1893 Health Act.

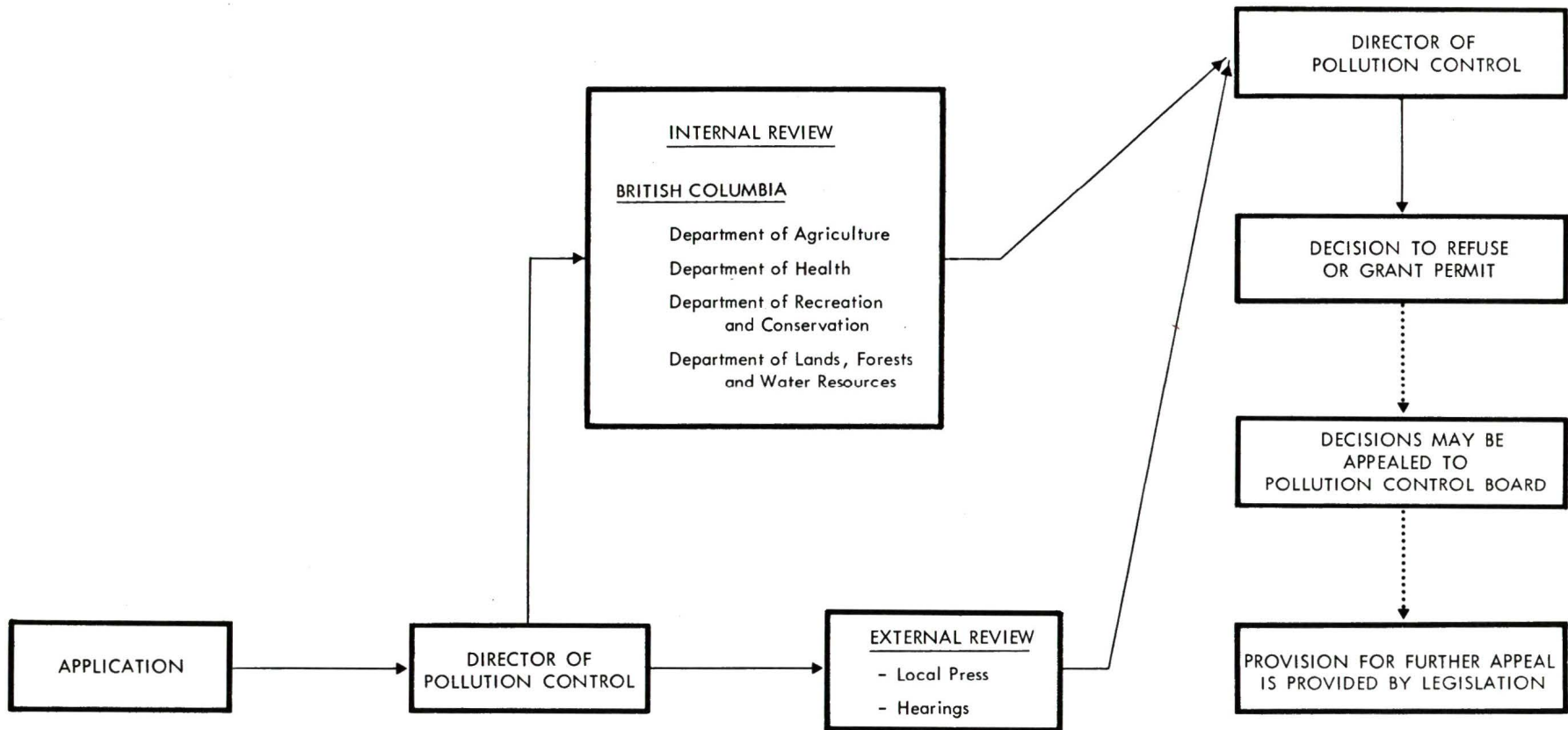
Pollution control as performed by the Pollution Control Board is executed on a permit basis. No person is allowed to discharge wastes into the water under the Board's jurisdiction without a permit or an exemption from the Board.³² The procedure to obtain a permit is outlined in Figure 5. The Director of the Pollution Control Board has the right to refuse, amend or grant a permit based on the assessment of the situation by engineers and other qualified investigators employed by the Board, which include Public Health professionals. Appeal against his decision goes first to the Board, and then, on appeal, can go before the Lieutenant Governor of the Supreme Court of British Columbia.

At present, the Board has a total staff of four engineers and one stenographer. Recognizing that the Board may not have adequate personnel the Act also provides that the Department of Health may recruit additional help. This provision is presently being implemented by utilization of the Public Health Engineers and Public Health Inspectors for sanitary surveys and water sampling. Furthermore, all samples taken for pollution control purposes are analyzed

32. Pollution Control Act, 1967, C. 34, S. 5(1).

FIGURE 5.

SCHEMATIC ILLUSTRATION OF PROCEDURES AND AGENCIES INVOLVED IN GRANTING A POLLUTION CONTROL PERMIT



in the laboratories of the Department of Public Health. Although designated authority for water control in British Columbia has been transferred out of the hands of the Health and Welfare departments to a more specialized agency, the responsibilities and activities of Public Health officials remain much the same. Furthermore, with the increased need for water quality management their task as both advisors and decision-makers has become even more crucial.

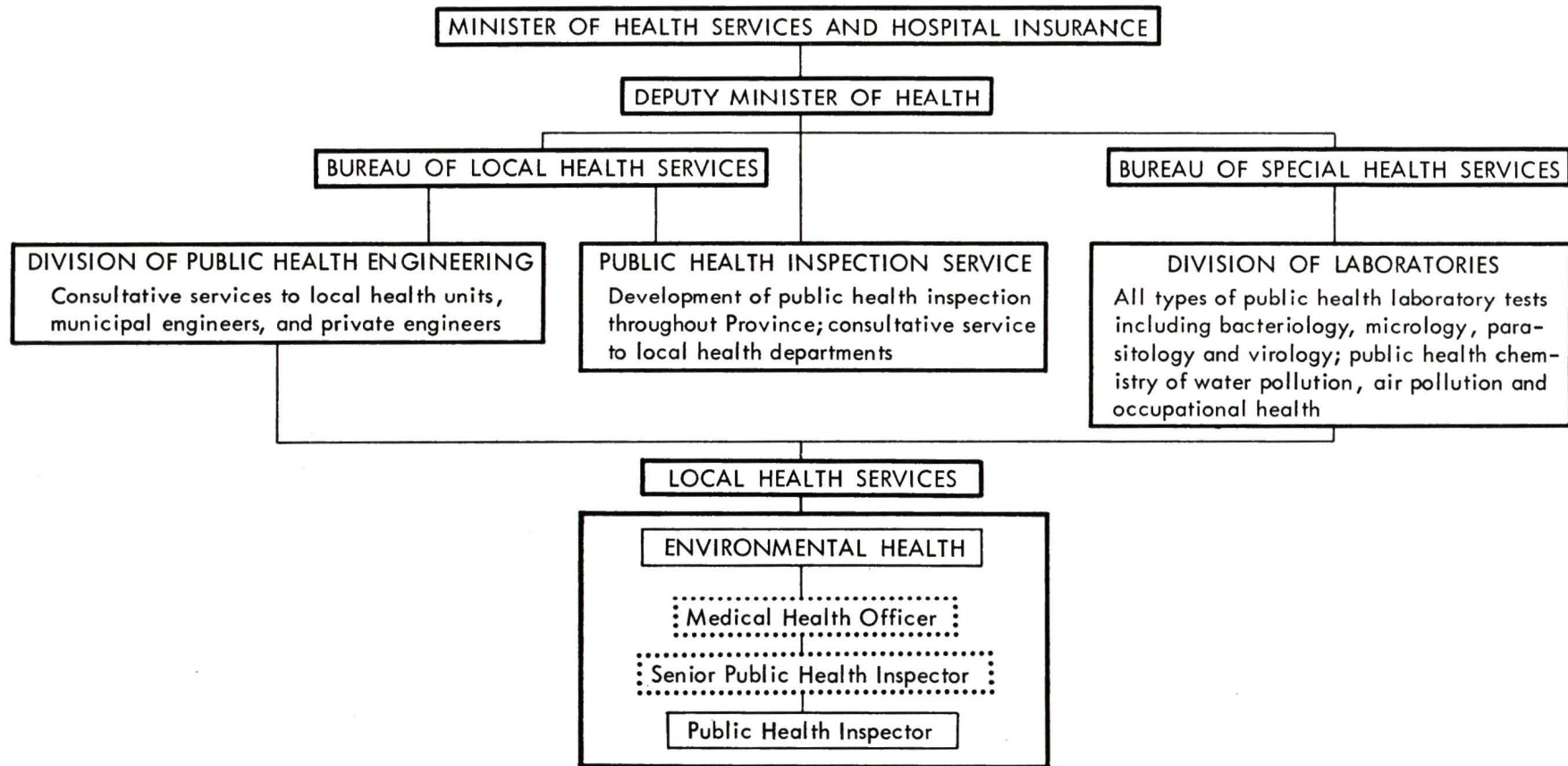
Public Health and Water Quality Management

The organization of Public Health Environmental Services represents a highly interacting system (Figure 6). The Deputy Minister of Health not only acts as a Pollution Control Board member but is also overseer of the basic groundwork on which decisions are made. Directly responsible to him on the provincial level are the Bureaus of Local Health Services and Special Health Services. The actual testing of water samples takes place in laboratories provided under the latter. The Bureau of Local Health Services is comprised of two specific agencies each performing a different but necessary role.

The Division of Public Health Engineering functions in both a regulatory and advisory capacity. It is responsible for approving all plans and specifications for public water and sewage construction in the province. Fur-

FIGURE 6.

PROVINCIAL HEALTH BRANCH ORGANIZATION: ENVIRONMENTAL HEALTH



Source: Province of British Columbia, Health Branch, Department of Health Services and Hospital Insurance, *Seventy-second Annual Report of the Public Health Services of British Columbia, For Year Ended December 31, 1968* (Victoria, B.C.:Queen's Printer, 1969), p. 5 with modifications.

thermore, the six engineers which presently comprise the staff of the division, offer a consultant service to Medical Health Officers and their field staff, on subjects relating to water (and air) quality control in the twenty regional Health Units in British Columbia. One of the most significant roles of these engineers in pollution control is, along with the local Health Unit staff, to consider all pollution control permit applications received for the information of the Health Branch. In addition to advising local Health officials, the services of the staff of the Division of Public Health are also available to private and municipal engineers who may seek their aid in matters relating to environmental control. For example, during the year 1968 its priorities included the implementation of a seven year policy requiring all provincial municipalities to treat their domestic sewage before discharge into surface waters; it prepared tentative water and air quality standards for the province, and granted provisional approval for the first tertiary treatment plant for a British Columbia community.³³ The Public Health Inspection Service

33. Province of British Columbia, Health Branch, Department of Health Services and Hospital Insurance, Public Health Services of British Columbia, Annual Report: Year Ended December 31, 1968 (Victoria, B.C.: Queen's Printer, 1969), p. 75.

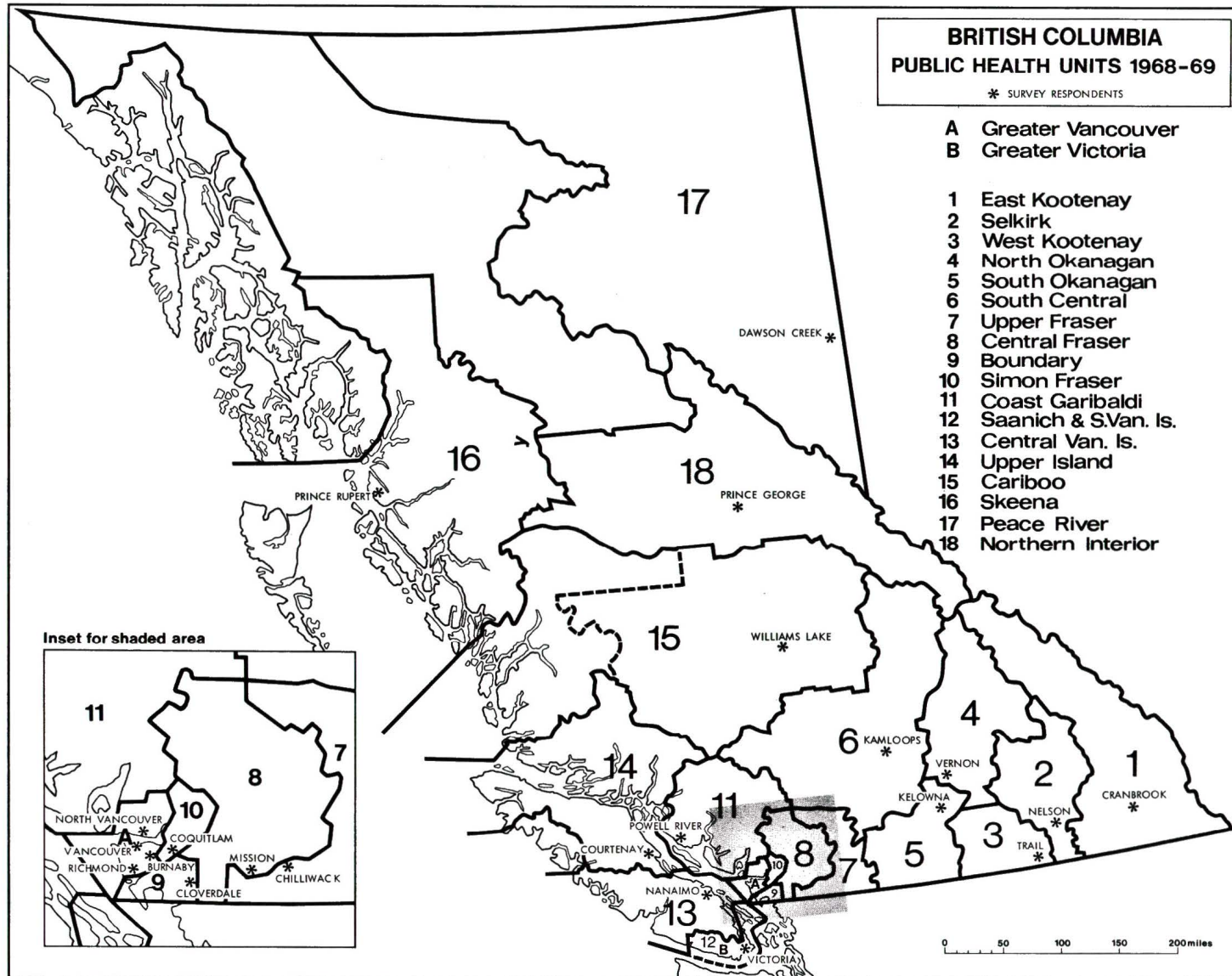
of the Bureau consists of several inspectors who work in a consultative and advisory capacity, passing out information and advice as required to the various local areas, planning in-service training sessions for the Inspectors in the field, and keeping the staff of the various boards aware of new techniques and new policies.

At the provincial level, the technicians, engineers and consultants provide many of the necessary services for effective water quality control. Given this institutional framework, it is pertinent to enquire how the quality of water is identified, assessed and regulated. This enormous and vital task rests with the local Health Units throughout the province.

The organization of Health services at the local level is fundamentally the same throughout the eighteen local and two metropolitan (Vancouver and Victoria) Health Unit areas in the province (Figure 7). However, services and staff vary from region to region according to needs and conditions. It should be noted that there is presently much controversy over the adequacy of these services and staff in many unit areas. Of the greatest concern in this study are the services provided under environmental health in these areas. Essentially, each area has a Director, or Medical Health Officer (MHO), and one or more Public Health Inspectors (PHI), who are professionals most involved with the manage-

**BRITISH COLUMBIA
PUBLIC HEALTH UNITS 1968-69**
* SURVEY RESPONDENTS

- A Greater Vancouver
- B Greater Victoria
- 1 East Kootenay
- 2 Selkirk
- 3 West Kootenay
- 4 North Okanagan
- 5 South Okanagan
- 6 South Central
- 7 Upper Fraser
- 8 Central Fraser
- 9 Boundary
- 10 Simon Fraser
- 11 Coast Garibaldi
- 12 Saanich & S. Van. Is.
- 13 Central Van. Is.
- 14 Upper Island
- 15 Cariboo
- 16 Skeena
- 17 Peace River
- 18 Northern Interior



ment of the quality of waters within their constituency. Each plays a unique but complementary part in the management and control of public water supplies.

The Medical Health Officer is the ultimate party responsible to the Provincial Health Department and to the Local or Union Board of Health on matters of environmental health. It is he who under the terms of reference of the Health Act is held responsible, as chief health and sanitary official of a municipality or region to which he is appointed, for the enforcing of all provincial and local health laws.³⁴ Essentially, his role is that of an administrator who interprets the policy of the government and takes appropriate action in the light of data gathered by his Public Health Inspectors. The Medical Health Officer assumes the responsibilities, but it is the Public Health Inspectors who carry them out, particularly in the field.

In most areas of the province each Health Unit employs two or more Public Health Inspectors. It is the Senior Public Health Inspector's function to administer the day to day programme, and direct the work of the inspectional staff. He is directly responsible to the Medical Health Officer and to the Local or Union Board of Health.

Firstly, plans for the source of supply and the distribution system for public water supplies, are presented

34. Province of British Columbia, Health Act, R.S. 1948, C. 141, S. 35.

to the Provincial authorities for approval. In addition, the local Public Health Inspector may do some testing of the source and make recommendations to the authorities concerning the need for treatment. He routinely performs bacteriological tests, and at times chemical tests, on each public water utility so as to be able to report to the Province at any time when the local water suppliers fail to take actions based on adverse results reported to them. Chlorine, and where applicable, fluoride content of these supplies are under close surveillance. Subject to the approval of the local Board he may also test private water supplies in the same manner. Moreover, when individuals or corporations apply to the Water Rights Branch for permission to utilize a surface supply, it is the Public Health Inspector who carries out a sanitation and environmental survey of the area and checks the water quality before the Branch will issue a water-use licence.

The Public Health Inspector responds to the problems of quality of supplies as a persuader and educator for the cause. First, if existing supplies continue to show signs of contamination, the Public Health Inspector attempts to convince the local Board of Health, the local Water Company, or the private owner, that treatment should be started. In the case of septic tanks and private wells outgrowing their effectiveness he tries to encourage the community concerned

to organize a water district and develop a public water supply. In organized areas the Public Health Inspector acts as a consultant to the local water works personnel supplying them with data and recommendations relating to day to day water quality readings, equipment and facilities. Secondly, when private septic tanks and tile field systems fail to function properly over a widespread area, the Public Health Inspector encourages the local community to install a sewerage system to overcome the problem, and to eliminate the potential menace to health. He sees that plans for the new system are submitted to the Department of Health for approval as required and advises these officials on downstream problems that may arise when the system is installed, and the effluent from the treatment plant becomes the new problem. Although it is the function of the Provincial Health Department to see that public sewerage systems are operated properly, the local Public Health Inspector does the actual bacteriological testing, testing for dissolved oxygen, tests for bio-chemical oxygen demand measurement on the final effluent, in addition to chlorine residual tests, so that the Provincial authorities may be advised if the treatment facilities are not maintained. The Public Health Inspector acts as a consultant to the local sewerage treatment plant operator, as in many cases local operators do not have the opportunity to attend proper courses in

conjunction with their work.

The third function of the local Public Health Inspector arises out of an agreement with the Department of Health, whereby the Pollution Control Board refers details of an application for sewage discharge into any lake, stream, or sea water to the local health service. The Public Health Inspector checks, on behalf of the Board, to see that the notice of application is posted in a conspicuous place at the site of the discharge and from his knowledge of the environmental conditions should the application be approved, he prepares a report which is forwarded by the Medical Health Officer to the Pollution Control Board Executive Engineer, making recommendations, and possible warnings against the perceived potential impact on recreational resources, shellfish beds and other uses adjacent or downstream waters, particularly downstream domestic usage.

In summary, the Public Health Official performs an important role in the decision-making network relating to water quality management in British Columbia. Acting as a technical advisor, administrator, and advocate planner, he provides inputs at various stages of the decision-making process. The role which he plays in a given decision-making situation is determined in part by the institutional framework of agencies, jurisdictional division of responsibilities, and laws which have been established at the var-

ious levels of administration. It is also determined to some extent by the Public Health official's own views about the problems to be solved, the kinds of solutions that he believes are appropriate, and his attitudes as to his role and that of others in the decision-making process. In the following sections an attempt is made to determine what some of these perceptions and attitudes are, and how they influence decisions.

CHAPTER 6

METHODOLOGY OF THE STUDY

This study presents an exploratory attempt to identify the factors underlying the perceptions and attitudes of a specific group of professionals involved in water quality management in British Columbia - those working in the Public Health field - and to indicate the ways in which such attitudes may affect the actual decision-making process. Since this group plays an important role in connection with environmental quality decisions, it was felt that such a study might aid in understanding the factors which condition human adjustment to environment.

Nature of Sample

The sample comprised a total of forty professionals.¹ A two-part questionnaire was administered, in May and June 1969, to the Medical Health Officer and the Senior Public Health Inspector, in each of the eighteen local Health Units and two metropolitan Health Units in the province.² (Figure 7).

1. The forty professionals involved nineteen Medical Health Officers; nineteen Senior Public Health Inspectors; and two Senior Public Health Inspectors acting as Directors of Health Units in the northern part of the province where efforts to hire a Medical Health Officer over the past few years have been unsuccessful. The latter two respondents were distinguished as "Medical Health officers" in the study on the basis of their responsibilities and duties.
2. Only one Health Unit refused to co-operate in this study. However, it was felt that although their involvement would have been of value, their omission did not impair the investigation. Those actually participating represented ninety-six percent of the total universe that could have been interviewed.

Medical Health Officers and Senior Public Health Inspectors were chosen for three main reasons. Firstly, they are intimately involved in decision-making in water management either as administrators or as technical advisors. Secondly, considerable reliance is placed upon these groups to define what the problems are and how they should be dealt with. Thirdly, the problems and issues with which they deal are becoming increasingly important in the water management field and especially those that are concerned with the quality of the environment.

A study of Medical Health Officers and Public Health Inspectors provides an opportunity to survey two distinct but complementary groups of professionals focussing on similar problems. In the larger Health Units there are a number of other personnel, junior Public Health Inspectors, who could have been included in the sample, on the basis of involvement in environmental health matters. However, for the purposes of this investigation, it seemed appropriate to concentrate only on those who are intimately committed to making policy decisions. It was also assumed that the knowledge and understanding attained in the study of British Columbian Public Health professionals might have important implications for the examination of Public Health professionals in the rest of Canada, and possibly elsewhere.

Hypotheses

Results of research undertaken so far, in the fields of psychology, political science, sociology and related fields including job analysis, and geography as discussed in the first part of this study, suggested several major hypotheses that might help in determining the factors underlying perceptions and attitudes, and the ways in which such perceptions and attitudes may affect actual decisions made by this group of professionals. The number of hypotheses that could have been tested was quite large. However, because of the limited time and resources available and the specific focus of this inquiry, it was felt that only those hypotheses which suggested themselves, by statistical inference, to be especially significant would be considered. Thus, it must be cautioned that a certain degree of bias was introduced at this stage. Other hypotheses that suggested themselves in the initial steps of the study are noted in Appendix C.

The primary hypothesis tested was as follows:

The ways in which Medical Health Officers and Public Health Inspectors perceive water quality problems and their solution, and the ways which they perceive their role and the role of others in taking action are principally a reflection of professional and biographical factors.

In order to make the testing of this hypothesis practicable, a number of secondary hypotheses were also formulated. The aim here was to identify which factors affect perceptions and attitudes, and the manner and extent to which such factors exert an influence. Briefly, it was hypothesised that with respect to decision-makers:

- (a) their perception of water quality problems;
- (b) their perceptions and attitudes toward their solution;
- (c) their attitudes as to the role of the public in taking action;
- (d) their attitudes as to the role of Public Health in taking action;
- (e) and their attitudes as to the role of government in taking action,

are each a function of the following:

- (i) their professional training
- (ii) their experience in the field of Public Health
- (iii) their age and years in Public Health
- (iv) and, their views toward Man-Nature relationships.

Questionnaires

A two-part questionnaire was constructed (Appendix D) to test the various hypotheses. Part I was administered to each of the respondents in a personal interview in their professional setting. The interviews lasted from one-half hour to four hours. The actual time taken varied with the time available to the respondent, and his interest and willingness to converse; often an informal interviewer - interviewee relationship was established and this usually resulted in a lengthening of the interview period. However, in all cases the necessary information was elicited, regardless of the time spent. Part II of the questionnaire, which related primarily to biographical data on the respondent, was left with him at the time of the interview to be completed at his own convenience and forwarded back to the researcher within a specified period of time. It is worth noting that all of those who agreed to participate in the study, completed both questionnaires.

The questionnaires were constructed in collaboration with members of the sociology and geography departments, at the University of Victoria. They were pre-tested in two stages. Since the final sample for the project was to include all the Health Units in the province, opportunities for pre-testings were very limited. The difficulties were overcome, however, by a fortuitous circumstance.

Within one metropolitan Health Unit (Vancouver) there are a number of sub-Units each having a comparable group of professionals to the sample chosen. Arrangements were made for the questionnaires to be pre-tested in three of these sub-Units. The results of the pre-test enabled several improvements to be made in the questionnaires.

A second step in the pre-testing was undertaken through discussions of the form and content of the questionnaires with several senior Provincial government and metropolitan officials. Their co-operation and suggestions proved invaluable.

Following the two stages of pre-testing, the questionnaires were revised. The final versions are included as Appendix D.

The questionnaires embraced a variety of questioning techniques based on both open-ended and forced choice responses. Information was gathered on various matters relating to the background, interests, and views of each of the respondents including age, professional training and experience, travel and residential experience, leisure time activities, views towards the environment, job satisfaction, etc. This information was provided to determine the possible professional and biographical influences underlying the perceptions, attitudes, and personality responses to environmental quality management.

Other questions were asked to elicit responses as to how they perceived the problems of water quality and their suggestions for resolving them. Data was also sought on how they perceived their role as Public Health professionals and how they deal with different kinds of problems that come before them. They were asked to evaluate certain components of the decision-making framework, in terms of satisfaction and of perceived limiting conditions of both internal and external constraints. Possible influences of the physical, social and political environments, in which they make their decisions were also explored. In addition, they were asked to consider the role of others, such as the public and other government agencies, in water quality management and decision-making.

The basic objective in gathering such information was to determine the extent of uniformity in patterns of response and possible divergences from these forms by certain groups of individuals. In delimiting these groups it was considered that variations in the experience, interests and motivations might aid in categorizing and accounting for differing points of view. Such analysis, it was believed, might provide further understanding as to the type of individual involved in making decisions on water quality management in the field of Public Health and the extent to which this is reflected

in his behaviour representations. The approach in this study therefore is not merely that of a descriptive treatise of the role of the Public Health professional but rather an analysis of how the attributes of these decision-makers appear to be related to their work-role conceptions.

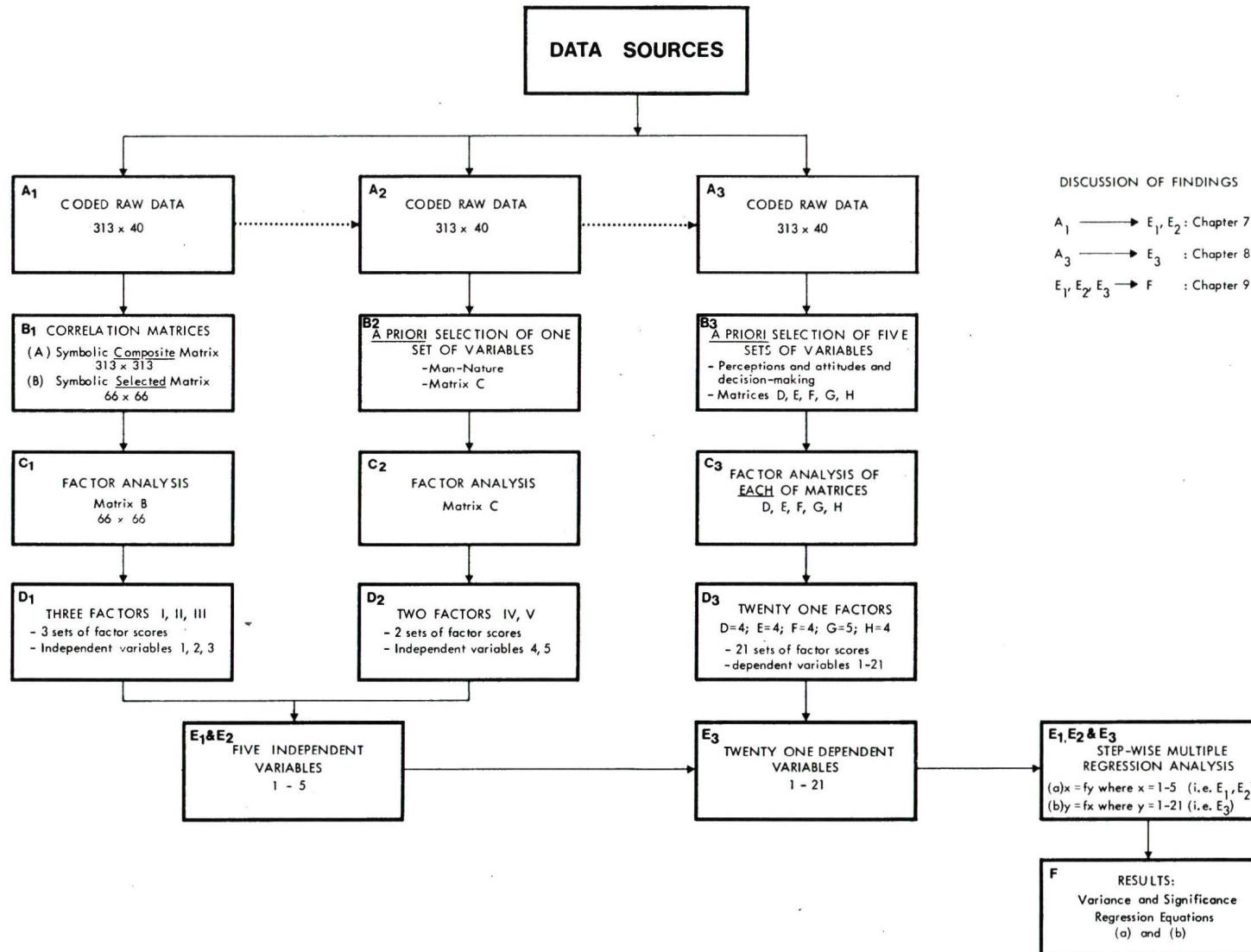
Analysis of the Data

In order to simplify the analytic procedure the data were coded and subsequently punched onto computer cards. The number of individual variables obtained from the questions totalled 313 from each of the respondents. The information was then subjected to a number of computerized analytical processes.³ These consisted of three main phases - correlation matrices, factor analysis,⁴ and step-wise multiple regression computation⁵ (Figure 8).

3. The amount of data gathered was voluminous. However, it was felt that considering the time, effort and expense incurred by both the interviewer and the respondent that as long as the information was relevant to the issue no constraints, except for time, would be imposed. Approximately 45,000 pieces of information were gathered from the eighteen page questionnaires administered to the total sample.
4. The factor analytical procedure used in the study is described in W.J. Dixon, ed., BMD: Biomedical Computer Programs (Berkeley and Los Angeles: University of California Press, 1967), pp. 169-184.
5. The programme for multiple regression employed in the third phase of data analysis is outlined in C.A. Bennett and N.L. Franklin, Statistical Analysis in Chemistry and the Chemical Industry (New York: John Wiley and Sons, 1954), Appendix 6A.

FIGURE 8.

ANALYSIS OF DATA



DISCUSSION OF FINDINGS
 A₁ → E₁, E₂ : Chapter 7
 A₃ → E₃ : Chapter 8
 E₁, E₂, E₃ → F : Chapter 9

Correlation Matrices

The calculation of correlation indices offered a basic method for objectively summarizing the extent of the linear relationship among multiple variables. Due to the number of variables involved and the amount of bias and subjectivity introduced in selecting variables a priori at this stage, it was felt that an all-inclusive correlation matrix might provide a useful overview of the data.

For convenience, a symbolic matrix representing the degree and direction of relationships among variables was calculated. This composite matrix is presented in Appendix E and referred to as Matrix A. A programme was written to calculate first, the statistical inter-relationship of each of the variables with each and every other of the 313 variables, in terms of a correlation index, and second, to transform this calculation into a symbol that would represent the degree and direction of the relationship. Five categories were chosen, in terms of .40 intervals:

- (a) '#' = $\geq + .60$
- (b) '+' = + .20 to + .60
- (c) 'blank' = 0 to + .20
- (d) '-' = - .20 to - .60
- (e) '=' = $\geq - .60$.

In order to simplify the areas of more intense association among the data a second matrix (Matrix B) was produced (Figure 9). The method whereby this second correlation matrix was devised was primarily one of rejecting those variables whose total number of first order (#, or =) or second-order correlations (+, -) did not amount to a certain "specified level". This "specified level" was calculated by graphing the total order of interrelationships (i.e., first order relationships were given a value of two, second order relationships valued at one, while those between $-.20$ and $+.20$ correlation and which appeared as blanks on the chart were not included), and from which the gradation in the line changed significantly, a cut-off point was arbitrarily assigned. In the case of first-order correlations this was found at the ≥ 5 level; while those of second order correlations were included if their inter-correlations totaled 81 and above. Those variables which attained the specified level in either one or both of these graphs were considered in the selected correlation matrix.⁶ Thus out of the total 313 variables and omitting the nine variables biased by the limitation of respondents,

6. Due to the nature of one question in the questionnaires which related to interests in the field of medicine and was responded to by Medical Health Officers and not by Public Health Inspectors, the nine variables involved in that question were excluded from the analysis at this point.

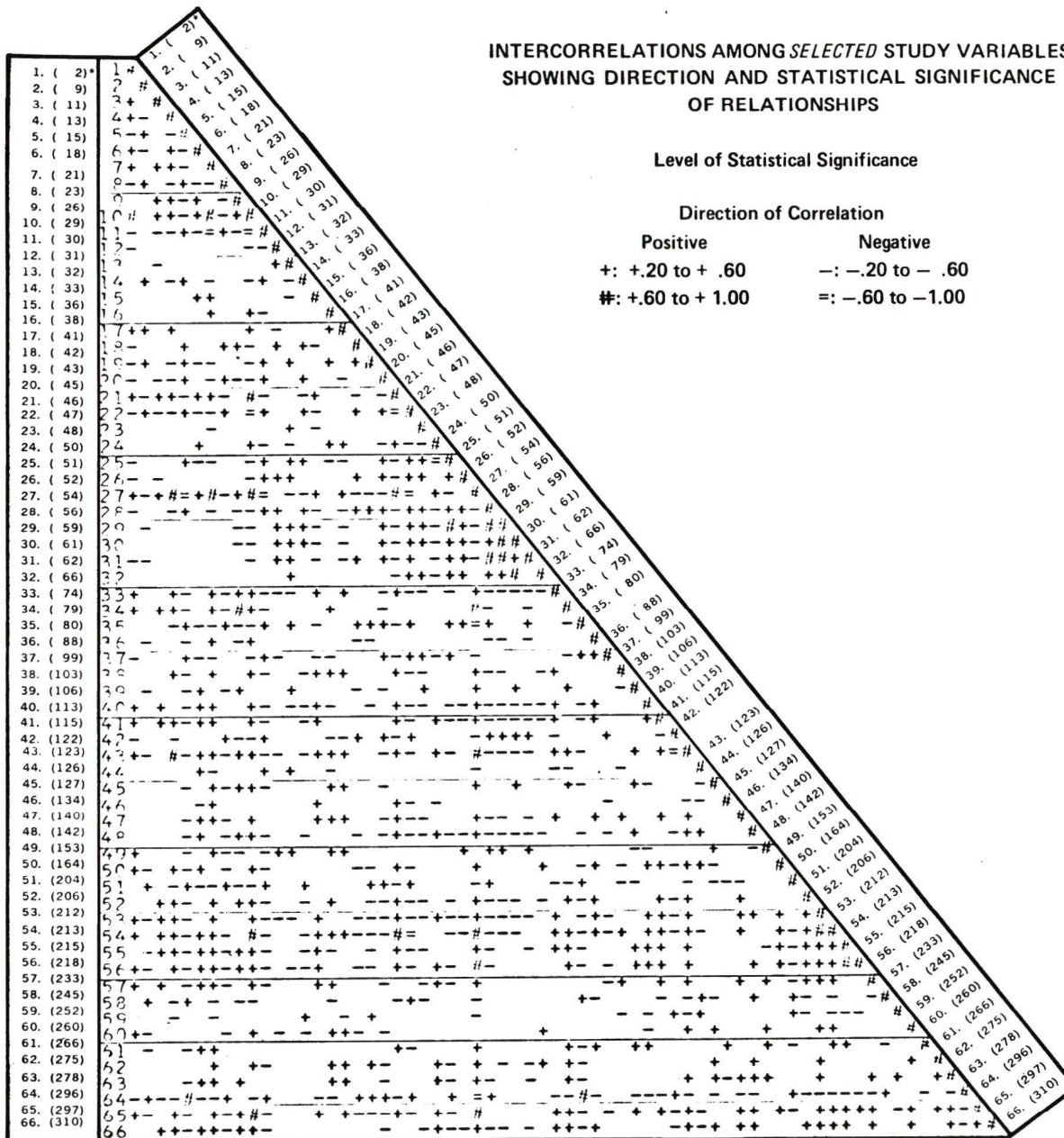
FIGURE 9.

INTERCORRELATIONS AMONG *SELECTED* STUDY VARIABLES
SHOWING DIRECTION AND STATISTICAL SIGNIFICANCE
OF RELATIONSHIPS

Level of Statistical Significance

Direction of Correlation

Positive	Negative
+: .20 to + .60	-: -.20 to - .60
#: .60 to + 1.00	=: -.60 to -1.00



* Numbers in Brackets refer to No. of variable in Composite Matrix.

sixty-six or approximately twenty-two percent of the total number of variables were considered sufficiently significant to be used in further analyses. In addition to providing an overall glimpse of the relationships within the data, the data derived in the selected matrix formed the basis for further reduction in the form of factor analysis and ultimately provided part of the input, in the nature of independent variables in the regression analysis.

Factor Analyses

One of the major problems posed by a large set of data, such as that gathered in this study, is the task of summarizing and interpreting the information. Factor analysis provides a convenient means of accomplishing this task. Its purpose is to identify those variables that are closely related to each other, and that are in some way distinct from other variables. The method involves examining the correlations between each of the variables in a matrix and selecting those with the highest degree of inter-correlation with each other. Such tactics serve to indicate a certain homogeneity among a number of specified variables that can be subsequently considered, in its new order, as a derived variable, or factor. Consequently, the original variables have been summarized into a number of new variables which generally mitigates the former.

Factor analysis is particularly useful in examining data relating to psychological aspects of human behaviour.⁷ Typically research in this field involves a considerable number of variables. Vocational psychologists, interested in isolating the components that are common to a large number of inter-related variables have used and developed the technique to a considerable extent.⁸ An increasing amount of the research undertaken by geographers on perceptions and attitudes is using factor analysis.

7. See, for example, C. Spearman, Abilities of Man (New York: Macmillan, 1927); and R.B. Cattell, Personality and Motivation: Structure and Measurement (New York: Harcourt, Brace & World, Inc., 1957).
8. In an excellent discussion, Guilford outlines the relative strengths and weaknesses of using factor analysis in psychological research. Moreover, he discusses the concepts inherent in factor analysis and their relationship to the development of psychological theory in terms of traditional Stimulus-Response and Cognitive theories. See J.P. Guilford, "Factorial Angles to Psychology," in Robert J.C. Harper, et. al., eds., The Cognitive Processes: Readings (Englewood Cliffs, N.J.: Prentice-Hall, 1964), pp. 366-385. Guilford argues the "adequacy of factor analysis as a method adaptable to the discovery of psychological concepts having theoretical significance." (Ibid., p. 384). His theory regarding the use of factor analysis is closely aligned to the cognitive behaviourists' approach outlined earlier in this study. However, he refers to his concept as factor psychology having a cognitive-response focus. He outlines it as follows: "Like behaviorism, the proposed factor psychology applies a completely objective approach and yields objective descriptions. Unlike behaviorism, it aims at the construction of a model of what goes on between stimulus and response rather than a model emphasizing stimulus-response correlations. Also unlike behaviorism, it finds no use for the concept of association and would substitute the concept of cognition-response sequences for that of stimulus-response associations." (Ibid., p. 384).

Factor analysis is a screening device which enables a preliminary sorting of data. Other techniques, such as multiple regression, can then be used for more intensive analysis.

In the present study factor analysis was used to examine seven different sets of raw data. Some twenty-one dependent variables were identified from five of the sets, and five independent variables were selected on the basis of the analysis of the other two sets.

Data for the identification of the dependent variables were grouped on the basis of five elements hypothesised to influence decision-making of Public Health officials in water quality management, namely:

- (1) perception of problems
- (2) perception of solutions
- (3) the perceived role of the public
- (4) the perceived role of Public Health, and
- (5) the perceived role of the government.

The analysis revealed twenty-one groups of variables each composed of closely inter-related variables, and each distinct from other groups. These were then assigned as the dependent variables to be used in further analysis.

The independent variables were derived from the analyses of the sixty-six highly correlated variables iden-

tified in Matrix B (Figure 9). The factor analysis produced three groups of variables, and these were used as dependent variables in the subsequent analyses. These three factors were: (1) the distinction between Medical Health Officers and Public Health Inspectors; (2) rank, and mobility; and (3) years in Public Health.

Two additional independent variables were included in the analysis for exploratory purposes. It was hypothesised that the way in which an individual views his relationship with nature might have some bearing on his perceptions and attitudes to water quality decision-making. Thus a conscious a priori grouping of those variables included in the raw data that might identify the viewpoint of the respondent were subjected to factor analysis. Two principal groups resulted: (1) Man over Nature, and (2) Nature over Man relationships. The latter completed the five independent variables identified for further summary and interpretation provided by multiple regression analysis.

Multiple Regression Analyses

As noted above, factor analysis provides a useful method for sorting out groups of variables. Other techniques of analysis are required, however, where summary measures of the extent and nature of the linear relation-

ship between a dependent and one or more explanatory, or independent variables are needed. Multiple regression analysis is one such technique.

The purpose of multiple regression analysis is two-fold; not only does it identify the effects of two or more (in this instance five) variables on a different set of variables, but also predicts these effects for another group of respondents under similar circumstances. However, the former aim is of more significance in this study. The correlation coefficient used as the basis in step 1 (Correlation Matrices A and B) and step 2 (factor analysis) describes only the nature of a linear relationship. What is needed is some knowledge as to the average change in one variable (dependent) that can be associated with a change in another variable (independent) or variables. Multiple regression therefore provides an understanding of possible causal links between variables.

For example, how much does the information contained in variable I account for the response indicated in variable D. Multiple regression allows the effects of more than one independent variable to be taken into account at the same time, i.e., How much do variables I_1 and I_2 together account for the response in variable D. Conversely, it can also show how much variable I_1 accounts for responses indicated

in variable $D_1 + D_2 + D_3$.

A five-stage, step-wise, linear regression analysis was used. In the present study during each stage of the analysis a different independent variable was entered into the regression equation in a step-wise fashion until no more significant variance was accounted for by inclusion of that variable as analyzed by a t-test exceeding .05.

Thus not only was the degree of relationships among selected variables identified, but also the extent and nature of this connection was defined, in terms of correlation coefficients.

Summary

Although the sample chosen for this study was relatively small, it was an all-inclusive "sample" for one particular area of study, British Columbia. The investigation of these professionals was intensive and yielded a large body of information which subsequently was transformed by various means, such as correlation, factor and multiple regression analyses, into a more compact form for further description and interpretation.

The influence of attitudes and perceptions of Public Health professionals on decision-making in water quality management in British Columbia was analyzed in

two stages in the present study. The first stage consisted of two parts: namely, the identification of those background characteristics of Public Health officials that might influence their decision-making behaviour; and the identification of perceptions and attitudes that might affect decisions about particular problems with which they have to deal. This stage is discussed in Chapters 7 and 8. An attempt is made in Chapter 7 to describe the characteristics of the Public Health professional. His perceptions and attitudes, and the role which these appear to play in his decisions relating to water quality management questions are discussed in Chapter 8. Various techniques of statistical analysis were used to identify the principal dependent and independent variables, based upon functional relationships which appear in the data. Results of these analyses are presented in Chapters 7 and 8.

The second stage of the analysis is discussed in Chapter 9. Here the purpose is to identify the nature and extent of the relationships identified in Chapters 7 and 8. With the results of multiple regression analysis described in Chapter 9, it is possible to identify which factors were the most important of those tested in influencing perceptions and attitudes of Public Health professionals.

CHAPTER 7

CHARACTERISTICS OF THE PUBLIC HEALTH PROFESSIONAL

Among Medical Health Officers and Public Health Inspectors many similarities and differences can be noted in reference to the following: (a) their professional training and experience; (b) their interests; (c) their environmental experience; and (d) their views towards the Man-environment relationship. Data relating to these matters are summarized in Tables 2 to 5 and their implications are outlined briefly below.

Professional Training and Experience

The Public Health professionals in British Columbia and in particular the Public Health Inspector have been practicing in the field of Environmental Health for an average of fifteen to twenty years (Table 2). Although most of them graduated during the period prior to 1950 the profession has a relatively high proportion of older persons. Many of them are over 55 years of age. Though they were fairly young when they obtained their first professional degree or diploma, many of them have spent more professional years outside the field of Public Health. This appears to support the fact that the Public

Health professional, and in particular the Medical Health Officer, has rejected the higher prestige specializations of his profession, for one reason or another.¹ Only twenty-five percent of the forty officials interviewed had selected Public Health as a career upon graduation, while twenty-eight percent had chosen to go into private practice. Yet, many of those who originally planned on a Public Health career, spent a considerable number of years pursuing careers in other fields. Of the forty respondents, forty-five percent had spent, on the average, six years in various business and industrial enterprises. An equally significant proportion had spent an average of five years in private practice. It is interesting to note that eleven of those interviewed, and in particular the medical professional, had spent from two to ten years serving in a professional capacity in the Armed Forces. This delayed or interrupted Public Health service is also noted in the fact that nearly forty percent of these professionals received degrees and diplomas in two other fields before entering Public Health. In contrast, over ninety percent of the thirty consulting and government engineers specializing in water resources, interviewed in Sewell's study, reported as having spent all of their pro-

1. See Edward M. Cohart and Ira V. Hiscock, "A Profile of the Public Health Worker," American Journal of Public Health, Vol. 45, No. 12 (December, 1955), pp. 1525-1532. See also, Infra., p. 4-6.

fessional career as engineers, in one capacity or another,² over sixty percent of them for a period exceeding fifteen years. The "professionalism" associated with engineering appears to have a more binding attraction than that which characterizes the Public Health profession.

Although the Medical Health Officer tends to rank Public Health high in his fields of interest in medicine, he, like the Public Health Inspector, has varied occupational interests. This might reflect, in part, the wide range of occupations their fathers had undertaken.³ However, among the professions they might consider entering to-day, teaching and engineering appear to dominate their interests. The fields of law and administration, public relations and related fields were also considered by many. Their responses suggest a close similarity to their present profession. This could be a reflection of satisfaction with what they are doing now, or those who are relatively older might be implying some difficulty of adjustment.

2. W.R. Derrick Sewell, "The Role of Attitudes of Engineers in Water Management," in Fred L. Strodbeck and Gilbert F. White, eds., Attitudes Toward Water: An Interdisciplinary Exploration (Chicago, Ill.: University of Chicago, Social Psychology Laboratory and Geography Department, unpublished manuscript, January, 1970).
3. Some studies have revealed that the Public Health professional's father's occupation was varied and not significantly related to the field of medicine. See, for example, Kurt W. Back, et. al., "Public Health as a Career in Medicine: Secondary Choice Within a Profession," American Sociological Review, Vol. 23, No. 10 (October, 1958), pp. 533-541.

TABLE 2

PROFESSIONAL TRAINING AND EXPERIENCE OF
PUBLIC HEALTH PROFESSIONALS

Variables	Number of Respondents
<u>*(45) Years in Public Health</u>	
1 - 4 years	3
5 - 14	12
15 - 20	10
over 20	15
<u>(7) Year of Graduation</u>	
before 1950	25
after 1950	15
<u>(8) Age of Graduation</u>	
20 - 25 years	29
26 - 30	7
over 30	4
<u>Degrees and Diplomas</u>	
First degree (14) M.D.	12
(15) P.H.	15
(16) Other	13
Second degree (17) M.D.	7
(18) P.H.	17
(19) Other	1
Third degree (20) M.D.	1
(21) P.H.	15
(22) Other	0
<u>Field Planning to Enter at Graduation</u>	
(78) teaching	3
(79) private practice	11
(80) Public Health	15
(81) hospitals, etc.	2
(82) other (business, industry, social agencies, etc.)	7

* Numbers in brackets refers to number of variable as located in Composite Correlation Matrix (Appendix E)

Table 2 (cont'd.)

Years Spent in Fields Outside Public Health

Fields Outside Public Health	1-5	6-10	11-15	16-20	Total
	No. of Respondents				
(23) business	8	5	3	1	18
(24) Armed Forces	8	3	0	0	11
(25) educational institutions	5	0	2	0	7
(26) private practice	8	3	1	0	13
(27) hospitals, etc.	14	1	1	1	17
(28) other	5	0	1	1	7

M.H.O. Rank of Fields of Interest in Medicine

Fields of Interest	Rankings									
	1	2	3	4	5	6	7	8	9	
(89) dermatology	0	2	2	2	4	2	2	4	1	
(90) epidemiology	1	10	2	2	1	0	1	2	0	
(91) general practice	0	5	1	5	3	1	2	2	0	
(92) internal	1	0	7	1	5	2	2	1	0	
(93) obstretics-gynecology	2	0	0	2	3	6	1	2	3	
(94) pathology	0	1	2	3	1	1	4	3	4	
(95) psychiatry	2	0	4	4	1	1	3	2	2	
(96) public health	11	1	2	0	0	3	1	0	1	
(97) surgery	2	0	0	0	1	3	3	3	7	

VariablesNumber of RespondentsOther professions might enter at present

(83) teaching	7
(84) law	4
(85) administration and public relations	4
(86) social welfare	2
(87) engineering	7
(88) other (farming, politics, communications, research, etc.)	8

Table 2 (cont'd.)

<u>Variables</u>	<u>No. of Respondents</u>
<u>Father's occupation</u>	
(1) professional (medical)	3
(2) professional and technical (other than medical)	12
(3) managerial	5
(4) clerical, salesman, service, recreation, transport, etc.	6
(5) primary industry, labourer, tradesman, etc.	10
(6) other	4
<u>Training institutes</u>	
(9) British Columbia	11
(10) Prairies	14
(11) Ontario	17
(12) U.S.A.	2
(13) Other (U.K., Germany, etc.)	13
<u>Administration courses in P.H.</u>	
(72) Should there be	40
(73) Have you taken any	34
Location of Course taken	
(74) Toronto, B.C.I.T., Army	13
(75) U.B.C. Civil Service Workshop	19
(76) Correspondence	6
(77) In-service	6
<u>Reason for entering Public Health</u>	
(32) chance	8
(33) personal contacts	11
(34) work content	9
(35) working conditions	5
(36) education and training	6
(37) "calling", "stepping stone", political appointment, etc.	3

Table 2 (cont'd.)

Variables	No. of Respondents					
<u>Prior experiences valuable to Public Health</u>						
(38) general learning	26					
(39) knowledge of community	18					
(40) administration	15					
(41) philosophy	12					
(42) specific technical procedures	9					
(43) person-to-person relations	32					
(44) other	7					
<u>Previous positions in Public Health</u>						
	<u>Position</u>					
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>
(46) senior	10	21	21	15	6	2
(47) junior	30	16	9	0	0	0
(48) no. of years: 1 - 5	30	25	17	12	6	2
6 - 10	5	7	7	3	0	0
11 - 15	2	3	3	0	0	1
16 - 25	3	2	3	0	0	0

The training of the Public Health professional, particularly as distinguished between the Medical Health Officer and the Public Health Inspector, is extremely varied. In general though, most had undergone their training courses in Universities and Institutes, notably in Ontario and European locations. The influence of Technical Training Colleges, such as Ryerson in Toronto, is noted in the case of the Public Health Inspectors. During their course of training more than thirty percent had received formal courses in Public Health Administration. An additional fifty per-

cent had attended government sponsored workshops.

The decision to enter the Public Health profession was noted as having rested predominantly on personal contacts, chance, and work content, unlike many water engineers who considered themselves "engineers at birth".⁴ This finding supports previous views on the Public Health professional.⁵ The nature of their reasons for entering Public Health is reinforced by their reflections of the types of prior experiences they consider to have been valuable to their Public Health occupation. While public relations and general learning were mentioned very frequently, administrative experience and specific technical knowledge did not appear to be compelling reasons for entering the profession. The former might be an indication of the nature of the job; what is required and what kind of people it attracts; while the latter might reflect inadequacy in training or the "chance" factor involved in entering the profession, as noted above.

Finally, what can be said about the professional experience of the individual once he has made his choice to enter the Public Health field? First, it is clear that the profession is characterized by a relatively high degree of Health Unit staff turn-over in respect to the groups studied. The Public Health professional tends to

4. Sewell, loc. cit.

5. Cohart and Hiscock, loc. cit.

be fairly mobile until he has transferred within the system at least on three and possibly four occasions. The results of the analysis suggest that not until they are promoted to a senior rank do they appear to settle in one Health Unit for any particular length of time. However, some other factor such as environmental conditions perhaps, must account for the fifteen senior staff respondents who made their fifth transfer, and especially those five who subsequently transferred into their sixth appointment.

Interests

An effort was made to determine the types of activities the Public Health professional engaged in during his off-duty hours, for this might have a significant bearing on his perceptions and attitudes toward both physical and social environmental quality (Table 3).

In ranking their most important leisure time activities it was noted that there was no obvious pattern of recreational pursuits. Those who selected a sporting activity as their first choice seldom chose a similar item for their second choice. The two most popular choices were sports (i.e., golf, curling, hockey, etc.) and fishing or hunting. However, gardening and reading provided the second main interest for many of the respondents. Moreover, over fifty percent of the respondents quoted these

TABLE 3

LEISURE TIME INTERESTS OF PUBLIC HEALTH PROFESSIONALS

Variables	Number of Respondents
* (98) visiting with friends, partying, dancing	15
(99) reading, watching T.V., listening to music	27
(100) going to plays, concerts, lectures, museums	8
(101) driving for pleasure	6
(102) participating in clubs and other community organizations	8
(103) gardening and working in the yard	23
(104) photography	8
(105) workshop or homemaking hobbies	11
(106) sports (golf, curling, hockey, soccer, etc.)	19
(107) outdoor swimming or going to the beach	10
(108) boating, canoeing, or water skiing	12
(109) fishing or hunting	20
(110) camping or picnicking	13
(111) snow skiing or other winter sports	8
(112) hiking or nature walks	11
 (114) <u>Membership in Non-Professional Organizations</u>	
No. of Organizations of which a member	<u>Number of Respondents</u>
0	20
1 - 3	18
4 - 6	2
 (113) <u>Membership in Professional Organizations</u>	
No. of Organizations of which a member	
1 - 3	31
4 - 6	6
7 - 9	3

* Numbers in brackets refers to number of variable as located in Composite Correlation Matrix (Appendix E)

Table 3 (cont'd.)

Variables				No. of Respondents
(116) <u>Regular Reading of Non-Professional Journals</u>				20
No. of Journals	1	-	3	10
	4	-	6	7
	7	-	9	2
(115) <u>Regular Reading of Professional Journals</u>				40
No. of Journals	1	-	3	14
	4	-	6	20
	7	-	9	6
(117) <u>Participation in Outdoor Recreation</u>				37
(118) water-borne recreation				25
No. of times per year	1	-	5	2
	6	-	10	2
	11	-	15	4
	16	-	20	7
	over		20	10
(119) land-borne recreation				30
No. of times per year:	1	-	5	4
	6	-	10	7
	11	-	15	5
	16	-	20	1
	over		20	13

four groups of activities among their main five leisure time interests, with sixty-seven percent spending a high proportion of their time reading, watching television and listening to music. On the other hand, forty-seven percent of water engineer specialists were classified as "indoorsmen", while the remaining fifty-three percent spent the largest proportion of their leisure time pursuing outdoor camping, fishing, and swimming, etc. activities.⁶

Few of the Public Health professionals were involved in outside organized activities such as Chambers of Commerce, Lions, or tennis and bridge clubs. Similarly, a large proportion of these individuals do not subscribe to or regularly read many non-professional journals. However, some may not have listed what they actually read, e.g., Playboy, Readers Digest, due to the qualification 'on a regular basis' in the question. Yet there were fifty percent of the respondents who did not list any publications. Many, however, do tend to read an average of four to five professional journals on a regular basis and are members of one to three various professional organizations.

When asked to specify, if any, the nature and frequency of outdoor recreational pursuits only three respondents were found to be complete non-participants. However, seventy-five percent mentioned golf, sports, hunting, 6. Sewell, loc. cit.

etc., as relatively frequent pastimes. A slightly smaller proportion engaged in activities such as swimming, boating, fishing with a similar degree of fairly high frequency. Thus it was established that, although not ranked as the primary activity of the Public Health professional, outdoor recreation including water-based sports does demand a significant proportion of his activity during after working hours.

Environmental Experience

One of the secondary hypotheses postulated that perceptions and attitudes relating to environmental quality are related to experience in particular kinds of environments (Table 4). Thus the professional's views about certain water quality problems might be conditioned by whether he had lived mainly in urban or in rural settings, and whether he was frequently exposed to environmental quality problems outside his own area.

The study revealed that most of the Medical Health Officers in the province are of European descent, while most of the Public Health Inspectors are native born but come mainly from other parts of Canada. Dominantly, both groups come from rural areas. By and large they have lived and worked in such areas for most of their professional careers. Even those who are now working in the

TABLE 4

ENVIRONMENTAL EXPERIENCE OF PUBLIC HEALTH PROFESSIONALS

Variables	Number of Respondents	
<u>Hometown</u>		
* (120) B.C. (rural)		3
(121) B.C. (urban)		5
(122) elsewhere in Canada		21
(123) U.K., Germany, etc.		11
<u>Lived 5 Years Ago</u>		
(124) same area (rural)		9
(125) same area (urban)		4
(126) another area (rural)		16
(127) another area (urban)		11
<u>Travel Experiences</u>		
(129) one or more provinces in W. Canada (other than B.C.)		35
No. of times in last 5 years:	1 - 5	29
	6 -10	5
	11 -20	1
(130) One or more states in W. U.S.A.		34
No. of times in last 5 years:	1 - 5	24
	6 -10	7
(131) Eastern Canada		25
No. of times in last 5 years:	1	14
	2	5
	3	3
	5	1
	20	2
(132) Eastern U.S.A.		10
(133) No. of times in last 5 years:	1	7
	2	2
	3	1
(134) Outside North America		14
(135) No.of times in last 5 years:	1	10
	2	3
	3	1

* Numbers in brackets refers to number of variable as located in Composite Correlation Matrix (Appendix E).

more urbanized parts of the province had spent most of their life in rural areas. A large proportion of the practicing Medical Health Officers were of Irish and Scottish descent citing such reasons for emigrating as "dissatisfied with the Medicare system in the United Kingdom" and "since no Canadian appeared to want the job, the opportunity for a North American standard of living was offered to one who found the demand market at home saturated". Since many Public Health professionals in British Columbia are either immigrants to the Province, or to the country, such elements as past experiences both personal and professional, familiarity, and adjustment processes, would appear essential in explaining his varying perceptions and attitudes to problems, solutions and role conceptions. This facet, however, was not explored in any depth in this study. It is offered merely as an observation and possibly merits further consideration.

Public Health officials in British Columbia travel to various places in connection with their work and recreation. For the most part, however, this travel is fairly short distance, limited in most instances to fifty miles from their home base. The environments visited are broadly similar in nature. Some of them travel longer distances, but very infrequently. Very few of those interviewed had travelled beyond Western Canada or the Western

United States in the past five years.

It is possible, therefore, that perceptions and attitudes of Public Health officials could be conditioned to an important degree by the fact that rural circumstances dominate in their experience. Problems of industrial, commercial, and domestic pollution are generally much less severe in such areas, if in fact they appear at all. Furthermore, lack of exposure to such problems through travel may also limit the official's perspective in this connection. Knowing that there is a smog problem in Los Angeles is not the same thing as having experienced its effects.

Views About Man-Environment Relationships

Another possible explanation of perceptions and attitudes relating to environmental quality may be found in views about Man's relationship to Nature (Table 5). Such views were elicited through a series of questions relating to the potential impact of technology on the environment. The answers revealed attitudes both as to Man's control over Nature, and as to the moral issues involved in attempting such control. A general question was posed about the role of technology in solving human problems, followed by a series of questions concerning the proposed large scale transfer of water from northern North America to the southern part of the United States and Mexico,

TABLE 5
VIEWS TOWARD THE ENVIRONMENT

Variables	Number of Respondents
* (145) <u>Is Technology an Answer to All Problems</u>	16
(146) human relations	15
(147) money and politics	15
(148) "double-edged sword"	7
<u>Who Should Control Technology</u>	
(159) scientists	7
(160) politicians	8
(161) scientists and politicians	10
(162) scientists and general public (non-political)	15
(149) <u>NAWAPA Scheme</u>	
In Favour	18
Not in Favour	22
<u>Weather Modification</u>	
(150) knowledge	39
(151) feasibility	32
How far should we go?	
(152) small scale	10
(153) large scale	11
(154) other	19
<u>S.S.T.</u>	
(155) favourable	9
(156) unfavourable	11
(157) good and bad	17
(158) don't know	3

* Number in brackets refers to number of variable as located in Composite Correlation Matrix (Appendix E)

known as the NAWAPA Scheme;⁷ the possibilities of modifying the weather;⁸ and the development of a supersonic transport aircraft, known as the S.S.T.⁹

In reply to the question of technology being able to resolve most of the problems faced by society, sixty percent of the respondents answered negatively. Those who felt that technology was inadequate in this regard suggested that: (a) it depended upon the perception of need or opportunity to employ technological means; (b) technology was a "double-edged sword" - it created problems, such as those resulting from the use of DDT, in efforts to solve difficulties faced by society; and (c) there are problems

7. For discussions of the North American Water and Power Alliance (NAWAPA) scheme, see Bulletin of the Atomic Scientists (September, 1967), pp. 1-27. This symposium issue of the Bulletin presented views about differing aspects of the proposed scheme, including politics, economics, engineering, and ecology.
8. The possibilities and implications of modifying the weather are discussed in W.R. Derrick Sewell, ed., Human Dimensions of the Weather (Chicago, Ill.: University of Chicago, Department of Geography Research Paper No. 105, 1965); and Robert G. Fleagle, ed., Weather Modification: Science and Public Policy (Seattle, Wash.: University of Washington Press, 1968). A recent research project conducted in association with the United States Department of the Interior, Bureau of Reclamation attempted to measure public attitudes toward weather modification in the San Joaquin Valley of California. See Darlene A. Krueger, "Measurement of Attitudes Toward Weather Modification," Atmospheric Water Resources Research (Fresno, Cal.: Fresno State College, 1970).
9. Problems relating to the S.S.T. are described in William S. Shurcliff, S.S.T. and Sonic Boom Handbook (New York: Ballantyne Books, 1970).

that exist that are not amenable to technological solutions, such as, for example, the Watts Riots, and drug addiction. The remaining forty percent of the respondents were optimistic about the problem-solving capabilities of technology. Many of them suggested that it had already solved most of Man's problems and that the only limitations were those of money and the administrative or organizational means to put it into action. Man's dominant role in the interplay with his environment is clearly defined in the latter comments, while the former group indicate a somewhat reversed attitude.

It is noteworthy, at this point, to compare the responses of engineering professionals to a similar question.¹⁰ While nearly eighty percent reflected a "Nature over Man" attitude, less than half of them considered technological advancement as a provider of solutions to the world's ills. Like the Public Health professional, the engineer appeared to concede that human nature and the societal system are more significant considerations. Sewell notes a close functional relationship among those who expressed concern over the limited capabilities of the technological fix, with those who consider Nature the dominant partner, and are extremely cautious over large-scale weather modification activities.

10. Sewell, loc. cit.

Man now has the technological capacity to make vast alterations in the environment, and perhaps even destroy it completely. To provide another indication of their attitudes towards the Man-Nature relationship the respondents were asked to suggest a group of persons to whom they would entrust the control of technology and make decisions as to its use. Opinion was considerably divided on this point. However, a primarily non-political group, comprised of a number of experts and laymen, was proposed by thirty-eight percent of the professionals while another twenty-five percent of the respondents would allow a mixed group of scientists and politicians; but none would place complete trust in either a body of scientists, a body of politicians, or a body of laymen!

The attitudes expressed regarding the role of technology were also reflected in views relating to specific technological innovations. The NAWAPA scheme was regarded by fifty-five percent of those interviewed as an unfavourable proposition for Canada at the present time. The objections to the NAWAPA proposal were based mainly on political grounds. Such comments as "the U.S. should clean up its own water," "we do not know our future needs" or "the cost of supply will increase" were made. However, there was no discussion as to the ecological threats posed by such a programme nor of the alternatives that might pos-

sibly offset their foreseen deprivation. Those, on the other hand, in support of NAWAPA defended it as a means of co-operation with the United States and one which could provide Canada with substantial funds.

Emotionalism also rated high with engineers in response to the NAWAPA scheme.¹¹ An even larger proportion of these water specialists, approximately seventy-five percent, were unfavourably disposed to the proposal. Even though many of them noted ecological and economic detriments, their main objection lay in the moral aspect of "relinquishing the reins" on national resources.

All but one of the Public Health respondents were aware of attempts to modify the weather. Eighty percent thought that such programmes were technically feasible. The extent to which weather modification techniques should be applied, however, given the present technical capabilities, drew a divided response. While twenty-five percent felt that small scale application would not be harmful, another twenty-five percent or more considered large scale use i.e., of national or continental dimensions, practical. Nearly fifty percent wavered, demanding appropriate justifications for both small scale and large scale schemes in terms of various constraints. Several arguments against widespread use were given. Some of the reasons expounded included the lack of knowledge of techniques and effects,
11. Ibid.

the lack of necessity, the large costs involved, and "Man should learn to live with Nature's destiny". Those who would permit it on a small scale would confine it to specific purposes, such as agricultural needs. As in the responses to the questions on NAWAPA, the main emphasis was on costs and needs, rather than on consequences. The attitudes expressed to the technological advance represented in the development of the S.S.T. were similarly viewed unfavourable for reasons involving costs and effects. As one of the respondents commented, "The brains used in conceiving the S.S.T. will be needed to solve the host of problems it will create."

A cautious attitude towards attempts to modify the weather and developing super-sonic transportation was also expressed, but less emphatically, by engineering professionals involved in water management in British Columbia.¹² In the first place, weather modification was considered feasible by eighty-seven percent of the engineers, fifteen percent of whom acknowledged large-scale practice favourably. Secondly, while sixty percent of the engineers interviewed envisioned the S.S.T. as a technological challenge - "An engineer's dream", the economic and social problems affected by such were commented on by the remaining proportion who were more skeptical of the innovation. Even though engineers appeared to be opposed more strongly to large scale
12. Ibid.

weather modification than to the S.S.T. they were not unlike the Public Health professional in their hesitancy regarding Man's technological capabilities.

The Derivation of Five Independent Variables

The significance of the biographical and social characteristics of the Public Health professionals interviewed in the study and discussed above were assessed under further analytical procedures. The aim here was to determine the extent to which such characteristics account for variations in perceptions and attitudes toward water quality management decision-making.

The variables mentioned in the preceding section of this chapter, dealing with professional training and experience, interests and environmental experience were highly correlated with one another and provided the primary basis for the Selected Correlation Matrix (Matrix B, Figure 9) derived by an objective process of elimination discussed in Chapter 6. The resulting sixty-six variables referred to were then factor analyzed in an effort to determine inherent patterns of functional correlation relationships. The results are displayed in Table 6.

The three factors derived in this programme together account for forty percent of the variance explained in the

TABLE 6

DETERMINATION OF INDEPENDENT VARIABLES:

ROTATED FACTOR MATRIX¹ - SELECTED CORRELATION MATRIX

Variables	Factor Loadings ²		
	I	II	III
1. Fathers Occupation: (professional & technical other than medical)	0.397	*	*
2. Training Institute (B.C.)	-0.626	*	*
3. (Ontario)	*	*	*
4. (other)	0.564	*	-0.325
5. Degrees and Diplomas: (1st-P.H.)	-0.708	*	0.414
6. (2nd-P.H.)	0.499	*	*
7. (3rd-P.H.)	0.550	*	-0.440
8. Fields Outside P.H. and No. of Yrs: (business and industry)	-0.513	*	0.343
9. (private practice)	*	*	-0.416
10. Basic Discipline: (medicine)	0.548	-0.405	-0.481
11. (Public Health)	-0.523	*	0.460
12. (other)	*	0.305	*
13. Main reason for entering Public Health: (chance)	*	0.410	*
14. (personal contacts)	-0.348	*	*
15. (education and training)	0.329	-0.415	*
16. Prior experiences valuable to Public Health: (general learning)	*	*	-0.597
17. (philosophy)	*	*	-0.528
18. (specific technical procedures)	-0.326	*	*
19. (person to person relations)	-0.552	*	*
20. Years in Public Health	*	0.310	0.700
21. Previous positions in Public Health: 1st (senior level)	0.611	-0.526	*
22. (junior level)	-0.611	0.526	*
23. (Health Unit No.)	*	0.551	-0.315
24. 2nd (senior level)	*	-0.534	0.329
25. (junior level)	*	0.681	*
26. (Health Unit No.)	*	0.599	*
27. M.H.O./P.H.I.	0.717	-0.309	-0.543

Table 6 (cont'd.)

Variables	Factor Loadings ²		
	I	II	III
28. Previous positions in Public Health: 3rd (junior level)	*	0.659	*
29. 4th (senior level)	*	0.870	*
30. (Health Unit No.)	*	0.807	*
31. (No. of Years)	*	0.649	*
32. 5th (No. of Years)	*	0.607	*
33. Admin courses taken (Toronto, B.C.I.T., Army)	*	-0.436	-0.338
34. Field planning to enter at graduation (private practice)	*	*	-0.564
35. (Public Health)	-0.528	*	0.358
36. Other professions might enter (other)	*	*	*
37. Leisure time activities: (reading, T.V., music)	*	*	*
38. (gardening * working in yard)	*	-0.304	*
39. (golf, hockey, curling, etc.)	0.313	*	*
40. No. of professional organizations (membership)	0.558	-0.484	*
41. No. of professional journals (subscriptions)	0.395	-0.463	*
42. Hometown: (elsewhere in Canada, other than B.C.)	*	0.313	0.398
43. (U.K., Germany, etc.)	0.454	*	-0.497
44. Lived 5 years ago: (another area - rural)	*	*	*
45. (another area - urban)	*	*	-0.609
46. Travel experience: (outside North America)	*	*	*
47. Major problems facing B.C.: (lack of health experience)	*	-0.356	*
48. (other social problems)	*	-0.458	*
49. How far with weather modification (large scale)	*	0.348	-0.356
50. B.C. environment deteriorating: Air pollution	0.558	*	*
51. Ideal time spent on water quality tasks	-0.595	*	*
52. Use of mass communication: (Y/N)	*	-0.357	*
53. radio (No. of times)	0.422	-0.488	*

Table 6 (cont'd.)

Variables	Factor Loadings ²		
	I	II	III
54. Use of newspapers: (number of times)	0.610	-0.332	-0.329
55. Business trips: Victoria (number of times)	0.682	*	*
56. (meetings & conferences)	0.712	*	*
57. M.H.O. role (Health adminis- trator)	*	*	-0.402
58. Fair appraisal: (consultor and advisor)	*	*	*
59. Reason for transfer: (promotion)	*	*	*
60. Might encourage resignation (external politics)	*	*	-0.390
61. Frustrations (external politics)	0.513	*	*
62. Like about job: (co-workers who have great influence)	*	*	-0.588
63. (seeing implementation of your decisions)	*	*	-0.630
64. Consultations: (M.H.O.)	-0.682	*	0.381
65. (P.H.I.)	0.521	*	-0.415
66. Satisfied with courses of action (limited by lack of approp. admin, and reg.)	*	*	-0.403
Eigen value	9.820	8.099	7.030
Percent of Cumulative Common Variance	.149	.270	.377

1. In all references relating to factor analyses, the rotated factor matrix was used in this study.
 2. All loadings below ± 0.300 have been omitted in order to facilitate reading.
- * statistically insignificant

data.¹³ It should be emphasized at this point that the new variables or factors summarized by factor analysis in this study cannot be unconditionally defined. Thus a certain degree of subjectivity was introduced in defining the factors established. The problems associated with the use of primarily psychological data are reflected in the ambiguous nature of the co-efficients derived. However, the distinction between the Medical Health Officer and the Public Health Inspector ("MHO/PHI"), on the basis of professional training and experience variables is strongly reflected in Factor I. It invites more explicit analysis of the "sub-professional" groups within the Public Health environmental field. The distinction of this factor as a derived variable, is portrayed more clearly in Figure 10.

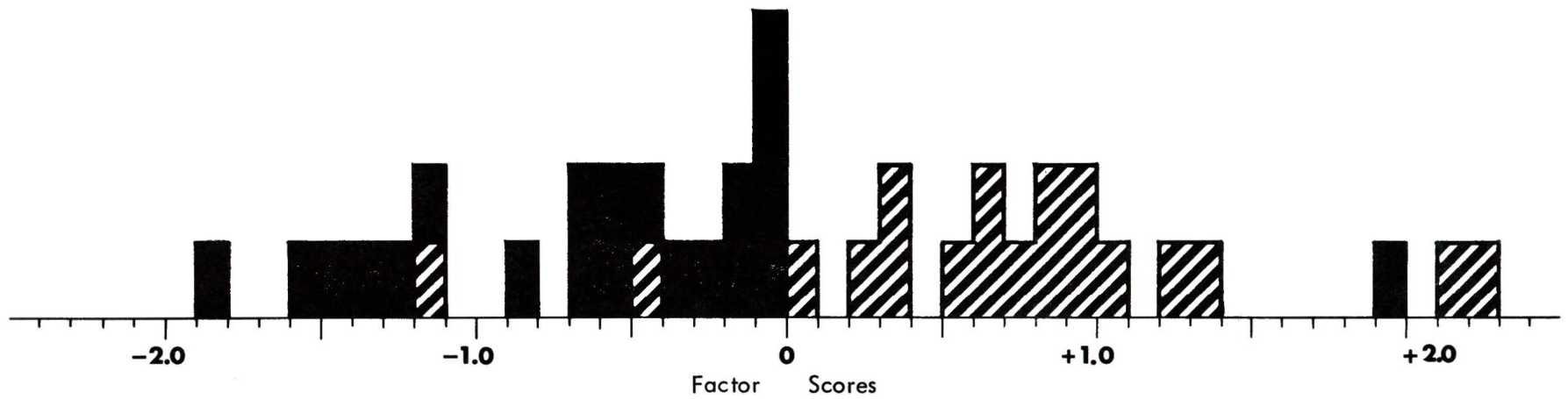
Factor II, with its predominantly high loadings of variables referring to the "Rank and Mobility" of the Public Health professional suggests that a strong pattern exists in which the Public Health professional is a rel-

13. Psychologists tend to regard the accounting for approximately thirty percent and above of the variance in the data statistically significant when dealing with psychological data. For an excellent "non-mathematical" discussion of the various computational techniques used by psychologists, and others, their validity and reliability characteristics, see Jacob Cohen, "Some Statistical Issues in Psychological Research," in B. Wolman, ed., Handbook of Clinical Psychology (New York: McGraw-Hill, 1965), pp. 95-121.

actively mobile individual who typically does not settle down until he has attained a senior post in the Public Health field, which generally occurs on his fourth transfer of position and Health Unit. Factor III can be attributed mainly to the length of experience in Public Health. Such experience is implied by the data to be partly a function of age. This factor will be referred to as "Years in Public Health." The three independent variables identified in the factor analysis here appear to be much more related to professional training and experience than to interests, recreational, residence and travel characteristics.

Eighteen variables were selected from the original data on an a priori basis from questions which related somewhat broadly to the perceived relationships of Man and his environment. Two fairly distinct factors emerged from the factor analysis (Table 7). The amount of variance in the data explained by these two factors although relatively low (twenty-eight percent) is still considered to be significant. In the light of the previous discussion relating to these variables and the factor loadings tabulated for each factor, a distinction, although relatively weak, can be made between the two. On the one hand, Factor I indicates a strong rejection of technology and its various effects, and suggests an attitude approaching that of nature being the governing factor in Man-milieu relationships. It has been designated

FACTOR SCORES: INDEPENDENT VARIABLE (FACTOR I)
"Medical Health Officer/Public Health Inspector"



Medical Health Officer



Public Health Inspector

as the "Nature over Man" factor. On the other hand, Factor II more strongly represents the "Man over Nature" theme in that more limited criticisms and more optimistic claims are made on behalf of technological progress. In particular, a strong negative factor loading resulted from responses reflecting a firm restraint to engage in weather modification activities, at any scale, even given the technological capability (Table 7, Factor II, variable 10, "Other"). This factor has been designated as the "Man over Nature" independent variable. It must be cautioned that these two factors, in particular Factor II, are only surrogate measures of the Man-environment theme and therefore are not considered in very definitive terms.

The five factors derived from the correlation matrix (Matrix B, Figure 9), in a priori groupings, and subsequent factor analyses, were next transformed into a new set of variables, represented by factor scores. The factor scores denoted, for each of the forty respondents, a value of their relationships within their new modified contexts of "M.H.O./P.H.I."; "Rank and Mobility"; "Years in Public Health"; "Nature over Man"; and "Man over Nature". The degree to which these independent variables appear to influence perceptions and attitudes in the water quality management role of Public Health officials was tested in the multiple regression analyses discussed in Chapter 9.

CHAPTER 8

PERCEPTIONS AND ATTITUDES OF
PUBLIC HEALTH PROFESSIONALS

In order to identify variations in perceptions and attitudes of Public Health professionals toward water quality management decision-making it is necessary to categorize the information gathered. This was achieved on an a priori basis. It was assumed that the three principal influences upon the decision-making process are:

- (a) the perception of problems;
- (b) the perception of solutions; and
- (c) the perceptions and attitudes relating to the role of
 - (i) the public,
 - (ii) Public Health, and
 - (iii) the government, in taking action to deal with the problems.

Each of these influences was considered in deriving the dependent variables. The analysis revealed a total of twenty-one such variables.

Perception of Problems

Discussion of the Data Collected

Views as to the relative concern for the quality of the British Columbian environment and specifically that which related to the respondents' local area and jurisdiction were sought in an attempt to identify how Public Health officials perceive problems (Table 8). Specifically, they were asked to recall the types of water quality problems with which they dealt and the means by which they determined the degree of deterioration. In addition, inquiry was made into the non-water pollution problems in their area and the channels through which they became aware of environmental quality issues.

The findings revealed that the major problems they perceived to be confronting British Columbia were closely related to their Public Health responsibilities. For example, pollution, poverty, education and housing were among those most frequently mentioned. However, approximately thirteen percent of the respondents, when forced to comment, felt that the Province's environment was not deteriorating. They claimed that it had even "improved over the past ten years, with pesticide use, garbage disposal, and air pollution from backyard incinerators having been curbed through rather stringent regulatory measures."

TABLE 8
PERCEPTION OF PROBLEMS

<u>Variables</u>	<u>Number of Respondents</u>
<u>Major Problems Facing B.C.</u>	
* (139) environmental quality	33
(140) lack of health facilities	8
(141) urbanization (housing, sewers, etc.)	9
(142) other social problems (poverty, unemployment, education)	20
(143) drugs, alcoholism, crime	4
(144) politics	6
 (163) <u>Quality of Environment Deteriorating in B.C.</u>	 35
(164) air	35
(165) water	34
(166) land	26
(167) other (noise, etc.)	3
 (194) <u>Non-water Pollution Problems in Local Areas</u>	 29
(195) air (pulp and sawmills)	20
(196) air (industrial and commercial)	8
(197) garbage disposal	14
(198) pesticides	2
(199) land (septic tanks, car graveyards, etc.)	8
(200) other (noise, etc.)	1
 <u>Water Quality Problems Dealt With</u>	
(279) sewage disposal	39
(280) potable drinking water	21
(281) chlorination	13
(282) fluoridation	15
(283) storm drainage	7
(284) wells	15
(285) recreation	32
(286) other (harbours, etc.)	17

* Number in brackets refer to number of variable as located in Composite Correlation Matrix (Appendix E).

Table 8 (cont'd.)

<u>Variables</u>	<u>Number of Respondents</u>
<u>Become Aware of Problems</u>	
(287) complaints	39
(288) personal observations and conversations	30
(289) surveys	24
(290) referrals	9
<u>Judge Water Quality</u>	
(291) E-coli	39
(292) B.O.D.	36
(293) C.O.D.	18
(294) visual characteristics	12
(295) turbidity, etc.	12
(201) <u>Water Quality a Hazard to Health</u>	31

Those who did express concern, however, noted in particular factors related to water and air pollution in British Columbia. In response to questions on non-water pollution problems in their local area, eighty-five percent indicated pulpmill and sawmill air pollutants and garbage disposal methods as having a critical effect on their environment.

Over the past three to four years the Public Health professional in British Columbia has been concerned with the deterioration of water quality as it relates to sewage disposal, recreational endeavors, and potable drinking water. Like the engineer,¹ the Public Health official tends to identify water problems in rather narrow terms - apparently bearing a strong reflection to those problems associated with their agencies defined responsibilities or with which they, personally, have been involved with in the past and at the present. For example, Sewell found that sanitary engineers viewed pollution issues as outstanding in their rating of problems facing water managers. Furthermore, the criteria by which problems were identified and courses of action devised, both by the Public Health and engineering water manager were found to be highly correlated to agency affiliation and the experience of the

1. W.R. Derrick Sewell, "The Role of Attitudes of Engineers in Water Management," in Fred L. Strodbeck and Gilbert F. White, eds., Attitudes Toward Water: An Interdisciplinary Exploration (Chicago, Ill.: University of Chicago, Social Psychology Laboratory and Geography Department, unpublished manuscript, January, 1970).

professional involved. Almost all of the Public Health workers noted E-coli and Biological Oxygen Demand (B.O.D.) laboratory tests as the principal means by which they determined the nature and degree of pollution in a water body, while less than half reported conducting various other tests.² Similarly, both government and consulting engineers quoted guidelines set by their national associations as main determining factors.³ The general courses of action taken by both groups of professionals were also strongly aligned to historical precedent and legislation. This is discussed in the succeeding section.

Contrary to results of other research,⁴ most of the officials interviewed in the present study accepted the assumption that declining water quality had been proven a

2. A noteworthy description of the various sampling criteria used by most Public Health professionals in British Columbia appeared in the local newspaper for one Health Unit area. It was an attempt to clarify and eliminate any misunderstanding among the public at large as to the technical procedures and what they mean in more layman's terms. The article, which was written by one of the respondents involved in this study, appears in Appendix F.
3. Sewell, loc. cit.
4. See John Hewings, "Water Quality and the Hazard to Health: Placarding Public Beaches," Natural Hazard Research, Working Paper No. 3 (Toronto, Ont.: University of Toronto, Department of Geography, 1969).

hazard to health. Although one or two cited personal experiences with persons who suffered "eye sores, skin rashes, and stomach disorders" from swimming in polluted waters, most tended to refer to isolated historical evidence such as the Hamburg and London hepatitis and typhoid epidemics of the 19th century. Others argued that since toxic water bodies had in many areas been highly substantiated as the leading cause of suffering, deformation and death for certain elements of marine life, such effects "would logically assume human dimensions." However, one-fifth of the sample noted that no conclusive evidence had been presented in the literature to-date. Most agreed, though, that in theoretical terms the possibilities of an adverse causal relationship between water pollution and human health was highly probable but that more intensive research was needed before it was regarded as scientifically conclusive.

It should also be noted that those Public Health professionals interviewed identified their knowledge and awareness to environmental quality problems as stemming from individual complaints and personal observations rather than from conducted surveys.

Factor Analysis

Factor analyzing this set of data was only partially successful. Four factors were identified and these are presented in Table 9. The extent to which some respondents considered all possible criteria available in determining the nature and degree of water quality is represented in Factor I. These officials appeared to test their samples not only for E-coli and B.O.D. determinants but furthermore employed Chemical Oxygen Demand (C.O.D.), visual and turbidity examination. Factor I was designated as "Multiple Quality Criteria". Factor II was designated as "Pesticides, Noise, and Purification" because the higher loadings identified those persons involved with problems of chlorination and fluoridation, as well as problems concerned with pesticides, noise and other pollutants in their area. Factor III identified a strong relationship between those who were concerned in their professional tasks with sewage effects on water quality and those who considered British Columbia's environment to be generally deteriorating particularly in reference to water quality as affected by sewage disposal. Factor III was designated as "Environmental Quality and Sewage Disposal." Some of those interviewed perceived the problems facing British Columbia, and the environmental quality issues in a fairly broad context. This is reflected in the loadings

TABLE 9
 DETERMINATION OF DEPENDENT VARIABLES:
 PERCEPTION OF PROBLEMS

Variables	Factor Loadings			
	I	II	III	IV
1. Major problems in B.C.:				
(environmental quality)	*	*	*	*
2. (lack of health facilities)	*	*	*	*
3. (urbanization)	*	*	*	*
4. (other social problems)	*	*	*	0.743
5. (drugs, alcoholism)	*	*	*	*
6. (politics)	*	*	*	*
7. Is B.C.'s Environment				
Deteriorating: (Y/N)	*	*	0.893	*
8. (air)	*	0.300	0.368	*
9. (water)	*	*	0.744	*
10. (land)	*	*	*	*
11. (other)	0.370	-0.313	*	*
12. Non-water Pollution Problems				
in Your Area: (Y/N)	*	0.304	*	0.518
13. (air - pulp & saw mills)	*	0.378	*	0.753
14. (air - cars, industrial &				
commercial)	*	*	*	-0.335
15. (garbage disposal)	*	0.397	*	0.310
16. (pesticides)	0.344	0.500	*	*
17. (land)	*	*	*	*
18. (other)	*	0.505	*	*
19. Water Quality a Hazard to				
Health	*	*	*	*
20. Types of Water Quality				
Problems Dealt With:				
(sewage)	*	*	0.508	*
21. (potable drinking water)	*	*	*	*
22. (chlorination)	*	0.788	*	*
23. (fluoridation)	*	0.693	*	*
24. (storm drainage)	0.392	-0.385	*	*
25. (wells)	*	*	*	*
26. (recreation)	*	0.394	*	*
27. (other)	*	*	*	0.471
28. Judge Water Quality: (E-coli)	*	*	*	*
29. (B.O.D.)	*	*	*	-0.452
30. (C.O.D.)	0.810	*	*	*
31. (visual)	0.624	*	*	*
32. (turbidity, etc.)	0.566	*	*	*
Eigen value	2.250	2.906	1.662	2.365
Percent of Cumulative Comm. Var.	.070	.168	.220	.294

resulting in Factor IV. This factor is designated as "Broad Perspective."

Perception of Solutions

Discussion of Data Collected

Given the identification of water quality problems, it is now necessary to classify the ways in which the Medical Health Officers and Public Health Inspectors perceived the methods and means through which they could resolve them. Information was gathered in the interviews on the procedures whereby Public Health officials deal with water quality problems, and as to the kinds of solutions they typically recommend (Table 10).

In describing the general procedure in taking action on water quality issues the response of those interviewed was unanimous. Four stages of action appeared to be taken by most of the officials: (i) sample the water body and send samples to Public Health Laboratories in Vancouver, B.C., for analysis; (ii) prepare a report on the findings of this analysis; (iii) if the samples indicate water quality adverse to human health, contact the offenders and demand eradication of the problem; and (iv) if the offender has not taken steps to resolve the problem, within a specified period of time, issue a summons. Ultimately,

TABLE 10

PERCEPTION OF SOLUTIONS

Variables	Number of Respondents
* (181) <u>Adequate Water Quality Criteria</u>	21
Improvements needed:	
(182) better facilities for sampling and testing	11
(183) enforcement and control legislation	18
(184) criteria based on local use	9
(185) meaningful bacteriological criteria	8
(186) meaningful chemical criteria	4
(180) <u>Adequate Legislation</u>	3
(307) <u>Satisfaction with Courses of Action</u>	11
Limited by lack of:	
(308) facilities and staff	10
(309) time, money, and research	16
(310) appropriate administration and regulation	20

*Number in brackets refer to number of variable as located in Composite Correlation Matrix (Appendix E).

the problem could be solved in a court of law.⁵ The pattern of response to this inquiry was not unpredictable. The above is indicative of Public Health environmental practices as defined both in textbooks and legislation, and prescribed for the professional.⁶

However, in order to evaluate the standard course of action available to the respondent, additional information was sought which perhaps would describe the situation more accurately. It was also felt that the gathering of this data might be one way in which the relative strengths and weaknesses of the present procedures could be identified. Respondents were asked, "Are the criteria available to you for measuring the nature and degree of pollutants adequate for your purposes, in your estimation?" The response to this question was divided. Those who answered negatively generally called for more uniform minimum standards and a further need for standards based on discriminate and localized uses of water bodies. They also felt that better facilities for sampling and testing the samples should be provided in addition to more vigorous application

5. Responses from those surveyed for the present study indicated that in nearly all cases the offenders were cooperative in their efforts to resolve the problems and in only one or two instances in the province did such offences lead to court action.
6. Due to the nature of a unanimous response to this question, the information was not subjected to further statistical analysis. It was regarded as definitive in its own right.

of presupposed standards. Those who appeared satisfied with the adequacy of the criteria also questioned the adequacy of the enforcement of the criteria. Answers to other questions revealed an almost general dissatisfaction with present legislation. Although many reinforced their view that the standards were not sufficiently precise for their purposes, the main criticism was found in the application of the legislation. Among the general comments offered, lack of enforcement of standards, lack of staff and finances, inadequate reprimand of offenders, and political interference were noted by many.

The respondents were asked to evaluate their satisfaction with the courses of action they are required to take. Of the nearly seventy-five percent who expressed a general discontentment with the means and methods they used, the limitations inherent in appropriate administration and regulation were perceived as the principal weaknesses. Some also charged that "industrialists and politicians need to realign themselves with today's problems", "no one is quite sure of who is in control and who is responsible for taking action", and "that such decision-making should not be harassed by politics". Moreover, the lack of time, money, and research was also a significant complaint.

Factor Analysis

Four groups of data relating to the perceptions and attitudes of solutions to water quality problems were summarized and identified by factor analysis (Table 11). Factor I suggests the extension of basic facilities for dealing with the sampling and analysis of water quality sources, and is designated as "Improved Facilities". Factor II relates mainly to the perceived need for improved administration and regulation and more rigorous criteria and standards. It is designated as "Improved Administration and Standards". Factor III infers a more specific need for the creation and use of more meaningful bacteriological and chemical criteria and is designated as "More Meaningful Water Quality Parameters¹."⁷ Many respondents pointed out that many of the new pollutants being discharged into water bodies in British Columbia have complex and unpredictable effects, and that much more sophisticated criteria and monitoring are needed. Factor IV indicates that some of the respondents were not distressed about present legislation, or criteria. It implies

7. The data used in this analysis was also used in an additional grouping of data later in the study, both resulting in similarly high factor loadings (Infra. Table 15, Factor II, p. 203). However, for experimental purposes, particularly as a different set of factor scores resulted in each of the two instances, it was decided to retain both as Dependent Variables. One is distinguished from the other by "More Meaningful Water Quality Parameters¹," and "More Meaningful Water Quality Parameters²."

TABLE 11

DETERMINATION OF DEPENDENT VARIABLES:

PERCEPTION OF SOLUTIONS

Variables	Factor Loadings			
	I	II	III	IV
1. Adequate Legislation: (Y/N)	*	*	*	0.842
2. Criteria: (need better facilities for sampling & testing)	0.789	*	*	*
3. (need enforcement and control legislation)	-0.385	*	-0.666	0.351
4. (need criteria based more on local uses)	-0.703	*	-0.445	*
5. (need more meaningful bacteriological criteria)	*	0.321	0.770	*
6. (need more meaningful chemical criteria)	*	*	0.786	*
7. Courses of Action: (limited by facilities & staff)	*	*	*	0.697
8. (limited by lack of time, money & research)	*	-0.838	*	*
9. (limited by appropriate administration & regulation)	*	0.861	*	*
Eigen value	1.303	1.588	2.019	1.358
Percent of Cumulative Common Variance	.145	.321	.545	.696

*statistically insignificant.

that those who are relatively satisfied with the present legislation attribute the lack of success of possible solutions to the limited facilities and staff available to conduct the sampling, testing, and enforcement procedures. Consequently, Factor IV was designated as "Adequate Legislation".

Perceived Roles of Various Groups

The focus thus far in the analysis has been upon the possible influence of various perceptions and attitudes of Public Health professionals on decisions relating to water quality management problems. Such decisions are also affected by the roles which they perceive for themselves and others in this connection.

As noted in Chapter 3 the decision-making network is composed of several groups of actors, such as the general public, technical experts, government agencies, and specialized agencies. Table 12 presents data relating to how the Public Health officials perceived the role of various groups in this connection. This information was based on responses to questions relating to the groups involved in decisions in particular Health Units, and the role of the Public Health Officer in obtaining advice, both internally within his agency and externally, from other organizations and individuals.

TABLE 12
 ROLES OF VARIOUS GROUPS IN WATER QUALITY
 DECISION-MAKING

Variables	Number of Respondents
<u>Groups Concerned with Environmental Quality in Local Area</u>	
* (187) recreation and service clubs	19
(188) civic officials and Chambers of Commerce	12
(189) Anti-pollution Committee	13
(190) health officials	28
(191) lakeshore property owners and ratepayers associations	10
(192) provincial and federal agencies	4
(193) others (teachers, students, farmers, old people, etc.)	14
(214) <u>Have you Organized Public Groups</u>	21
<u>With Whom Do You Consult in Decision-Making</u>	
Internal (296) M.H.O.	19
(297) P.H.I.	20
External (298) Head Office	32
(299) other provincial and federal agencies	16
(300) municipal councils	29
(301) private agencies	11
(302) other (public groups, etc.)	9
<u>Experienced Opposition From:</u>	
(303) "abnormal" minority groups	13
(304) politicians	26
(305) industrialists and developers	6
(306) individual members of public (recreationists, etc.)	10
<u>Water Quality Responsibilities in B.C. Should Be:</u>	
Department of Health	
(168) all	20
(169) sewage disposal and treatment	15
(170) garbage disposal and treatment	11
(171) recreation	3
(172) industrial and commercial effluents	2
(173) drinking water	4

*Number in brackets refer to number of variable as located in Composite Correlation Matrix (Appendix E).

TABLE 12 (cont'd.)

Variables	Number of Respondents
<u>Pollution Control Board</u>	
(174) all	3
(175) sewage disposal and treatment	0
(176) garbage disposal and treatment	1
(177) recreation	2
(178) industrial and commercial effluents	15
(179) drinking water	0
<u>Business Trips in Past Year</u>	
Victoria	
(216) training	1
(217) consultations	5
(218) meetings and conferences	13
Vancouver and U.B.C.	
(220) training	7
(221) consultations	5
(222) meetings and conferences	23
Other Health Units in B.C.	
(224) training	2
(225) consultations	10
(226) meetings and conferences	22
Outside B.C.	
(228) training	1
(229) consultations	1
(230) meetings and conferences	6

Table 12 (cont'd.)

Frequency and Destination of Business Trips in
1968-1969 Fiscal Year

Frequency	Destinations			
	Victoria (215) Number of Respondents	Vancouver & U.B.C. (219) Number of Respondents	Other H.U. (223) Number of Respondents	Outside B.C. (227) Number of Respondents
1	8	13	5	6
2	4	3	4	0
3	0	2	2	0
4	1	3	4	1
5	1	1	0	0
6	2	1	3	0
7	0	0	3	0
8	0	0	1	0
9 and over	0	6	5	0

	<u>No. of Resp.</u>				
<u>Community Groups as Public Health Representative</u>	39				
No. of Groups	1 - 5	6 - 10	11 - 15	16 - 20	over 20
	20	14	2	2	1
<u>Ranking of Possible Roles of M.H.O.</u>					
Possible Roles	1 No. of Resp.	2 No. of Resp.	3 No. of Resp.	4 No. of Resp.	5 No. of Resp.
(232) physician	2	6	10	13	9
(233) health administrator	13	13	7	2	5
(234) civic official	2	4	4	11	19
(235) leader or co-ordinator of community health affairs	18	10	4	6	2
(236) health educator	5	6	17	8	2

Table 12 (cont'd.)

Variable	Number of Respondents
(71) <u>M.H.O. Better Equipped</u>	25
<u>Public Image of Your Job</u>	
(237) under-estimate	26
(238) over-estimate	9
(239) fairly accurate	5
(240) <u>Fair Appraisal</u>	5
(241) general practitioner	11
(242) prevents communicable diseases	8
(243) regulator and enforcer, watchdog	8
(244) educator	8
(245) consultor and advisor	11
<u>Decision-making Role</u>	
(311) advisor	10
(312) decision-maker	4
(313) advisor and decision-maker	26

Role of the Public

Among the information given for the roles of various participants in decision-making both internal and external to the Public Health agency, selected variables were considered to be appropriately grouped for distinguishing the role of the general public in matters of environmental quality and in particular water quality. These were deduced from Table 12 and were then given further examination under factor analysis.

Discussion of the Data Collected

Among the various groups of individuals the Public Health professional was perceived as having a purposeful involvement in matters of environmental quality in their communities. Other than the Public Health official himself, recreationists, Chambers of Commerce and Anti-pollution Committees were reported to express particular interest and to accept the major portion of public responsibility. In this connection it is significant to note that where an organized Anti-pollution Committee existed in his area the Public Health professional did not find it necessary to initiate and organize a public group to attack such problems. However, some respondents did call on the advice and viewpoints of various representatives of the public, including municipal councils, private agencies

such as engineering consultants, and other recreational or ratepayer groups. Public Health officials also receive unsolicited opinions from various groups. Sometimes these endorse the proposals of the Public Health official but occasionally they are influential in opposing and constraining the courses of action he has chosen. Particular groups, such as "anti-fluoridationists," and recreationists were mentioned as occasional opponents to actions proposed by Public Health officials. "Crackpots" and "apathetic individuals who are unlettered, unread, and indiginous" were also noted. Several officials suggested that a "What was good for my grandfather is good enough for me" attitude contributed much to opposing various schemes and projects recommended by them, particularly, they noted, where financial outlays were needed. Basically, it was a question of a "conflict of individual priorities". Industrialists and developers were generally considered to be much less of a limiting factor. Many respondents, in fact, reported excellent rapport between Public Health and such interests. In some areas, however, Public Health officials were not as satisfied with the situation.

In summary, the Public Health professional viewed the public involvement, particularly within organizations as being effectual in their concern for the quality of the

environment. Yet, on the other hand, public involvement could also detract from the responsibilities and judgments of the decision-maker, especially when the former was technically ill-informed or emotionally fanatic.

Factor Analysis

Four distinctive patterns of response were found in this data (Table 13). Specifically, in regions where recreation and service clubs had not taken the lead in promoting the quality of the environment, splinter groups of individuals, such as older people, farmers, and teachers and students were instrumental in expressing the public interest. However, it was these individuals and groups of individuals along with a few industrialists and housing developers who typically provided opposition for the Public Health's tasks. Factor I was designated as "Dissatisfaction with Role of Public". However "Satisfaction with Role of Public" was expressed in the results of Factor II. These respondents tend to consult extensively with private agencies and other groups of the public without experiencing much opposition from them. Factor III indicates that Public Health officials sometimes receive opposition from particular organized groups which have a vested interest in the management of a given water resource. Among these small but vocal groups are organizations of ratepayers and prop-

TABLE 13

DETERMINATION OF DEPENDENT VARIABLES:

ROLE OF PUBLIC

Variables	Factor Loadings			
	I	II	III	IV
1. Groups concerned with environmental quality: (recreation and service clubs)	-0.670	*	*	*
2. (anti-pollution committee)	*	*	*	-0.787
3. (lakeshore property owners & ratepayers associations)	*	*	0.722	*
4. (other)	0.669	*	-0.339	*
5. Organize groups (Y/N)	*	*	*	0.658
6. Consultations: (private agencies)	*	0.864	*	*
7. (other)	*	0.884	*	*
8. Opposition: (abnormal minority groups)	*	*	0.680	*
9. (industrialists & developers)	0.647	*	*	*
10. (individual members of public)	0.623	0.303	-0.437	*
Eigen value	1.755	1.740	1.452	1.256
Percent of Cumulative Common Variance	.176	.350	.495	.618

*statistically insignificant

erty owners. This is reflected in the loadings for Factor III. The underlying motivations for opposition in this instance seem to differ from those involved in Factor I. In the former case opposition comes from individuals and groups with varied interests. The water resource is not necessarily viewed as private property. In the latter case, however, the water resource is often regarded as such. In addition, regulations are often much more direct in their impact than they are upon other groups. Factor III is designated as "Opposition from Vested Interests". Factor IV, "Organize Groups", is much more explicit than the others. It indicates a strong relationship between the need for and establishment of a concerted action group of individuals by the Public Health professional, in areas only where an organized Anti-Pollution Committee is not operating. However, the relationship is not completely conclusive and self-evident. The Public Health professional may not be an "organizer", even though he considered the existing Committee as unfavourable, either in its approach or its goals.

The Role of Public Health

Public Health involvement in environmental matters was considered by the Public Health professional in terms of his own role, the role of his colleagues, the role of the

Public Health agency, and the role of the Department of Health in general.

Discussion of the Data Collected

The general conclusion of the professional Public Health officer in British Columbia is to voice relative support for the division of responsibilities between the Department of Health and the Pollution Control Board in relation to the water quality issues presented (Table 12). Some suggested that "the Pollution Control Board is redundant and should therefore be abolished", or that it "should be reconceived as a division of the Health Branch, possibly under a Department of Public Health". Such arguments were based on the view that all water quality problems were considered to be health problems - whether physically or mentally induced. Although half of those surveyed demanded all water pollution problems to lie in the rightful domain of the Health Department, seventy-five percent of those remaining suggested that responsibility for industrial and commercial effluents be relinquished to the Pollution Control Agency. Perhaps this is a conscious attempt to put such relatively large scale issues in the hands of those who are technically and administratively more able to fight large Corporations and industries. The issues associated with domestic sewage and treatment, however, were considered

by approximately ninety percent of the professionals to be the rightful responsibility of the Department of Health, and specifically the concern of Public Health officials.

Within the hierarchy of jurisdictions and responsibilities, how did the Public Health professional view the role of other Health officials? The dependence upon Public Health Laboratory technicians to analyze and report to them on water quality samples was noted previously. However, other avenues for advice and consultation are available for the Public Health professional as described in Chapter 5. The need for and perceived accessibility of such advice was assumed to have a functional relationship with the frequency and nature of business trips taken to other areas. Of the total number of respondents eighty percent had indicated that they call upon the services of provincial representatives at the Head Office, of the Department of Health, particularly the "floating" Public Health engineers and Consultant Public Health Inspector. Furthermore, one-half of these had visited other Provincial Public Health officials during the previous year either for consultations or to attend conferences and meetings. Business visits to Vancouver for similar reasons were reported to be even more frequent. Distance and accessibility are noted as determining factors in the decision to participate. Those officials situated in less accessible parts of the province

have possibly been able to accommodate or compensate for the lack of such visits with more informal inter-change with his colleagues within and bordering his Health Unit boundary. From the data gathered it appears that some officials spend a great deal of time (on an average of ten trips for the year preceding the survey) travelling to consult with other Public Health professionals outside their Health Unit, and sometimes outside the province.

The perceived and actual role of the Public Health professional in decisions relating to environmental problems was analyzed in a number of ways. The amount of time which the Medical Health Officer and Public Health Inspector devote to water quality responsibilities varies, from five to fifty percent and fifty to seventy-five percent of their total time, respectively, and this also varies from area to area. However, many of these individuals would prefer to allocate much more time, some as much as twice the present allocation. Inadequate staff and facilities were again seen as limiting factors. Their tasks demanded not only routine duties but attendance at a large number of various community groups as representatives and defenders of Public Health interests.

The evaluation of their role as Public Health professionals revealed some interesting findings. When asked how

they perceived the public image of their job most seemed to feel that either the public is ill-informed about the Public Health official's role, since they typically underestimate his duties and capabilities claiming he is a "sewer sniper" or "school medical officer", or they overestimate his role and regard him as having some "magical powers" to solve all their problems "as a useful adjunct to solution of all detriments to human welfare". In evaluating the accuracy of the perceived public image of their job, only five respondents conceded that this image was correct. Their general comments included the following themes: "the Public Health official does get things done", "there are more limitations in the job than the public realizes", "that our role as educators is not widely recognized", and "that we do more investigation than the layman credits us". Sewell found on the other hand, that engineers considered the public image of their profession as highly accurate and well established.

The role of the Medical Health Officer as perceived by himself and by his counterpart, the Public Health Inspector, was also identified. Controversy within Public Health in recent years has been directed in part to the debate as to whether a medical professional was necessary for the role of Public Health Director whose primary responsibility is to administer the Health Act. The respon-

dents interviewed differed in their opinions on the matter. Although twenty-six of the respondents felt that medical training was essential a relatively large proportion were not convinced that it was. Those who said that the Medical Health Officer was better equipped than any other professional for the job, felt that medical training was a necessary ingredient in the tasks he has to perform. However, among those who disagreed, several pointed out that the amount of medical work had declined relative to other dimensions of the job, that problems such as sanitation and other forms of Environmental Health required training other than medicine, and that a well-trained administrator could better head the Unit. However, all agreed that administrative training was a prerequisite for the job.

In respect to the role of the Medical Health Officer, as perceived by the Public Health Inspector, a general admiration for his position and public service was expressed by almost all respondents. Many cited their broad understanding and the typical problems encountered in Public Health. They viewed the Director as fulfilling the role of a diplomat, a link between policy-makers and the public, a supervisor and motivator of Public Health workers, and an educator or "seller" of Public Health programmes to various elements of the public. These themes typified the

results revealed in ranking by both groups the five dimensions of the Medical Health Officer's role concluded by other researchers.⁸ It is apparent in these responses that the medical professionals in Public Health are seen by others and by themselves as leaders in community health affairs or as health administrators. Few of the Public Health Inspectors appeared to regard Medical Health Officers as health educators, even though they stress the importance of this under other categories.

The Medical Health Officers were in general agreement, that the Public Health Inspector is a vital and integral member of the Public Health team. With his close contact with the public and their problems he was thought of as "the eyes and ears" of the Health Unit. He represented the action force behind regulations and enforcement and was regarded by the Medical Health Officer, as an educator of the public. They felt that the Public Health Inspector's role is generally under-rated by the public at large.

A significant comparison can be drawn, at this point, between the findings of the present study and those derived in the engineers' study. In both instances two sub-groups of professionals were distinguished. In the former, between

8. See, for example, Edward Wellin and Sol Levine, "The Role of the Health Officer: A Sociological Inquiry" (Paper presented to the Committee on Preventative Medicine and Social Science, Social Science Research Council, 1960).

the Medical Health Officer and the Public Health Inspector; in the latter, between the government engineer and the consulting engineer. All four groups were asked to describe their perceived role of their counterpart. The responses bore striking similarity between the studies. The consulting engineer "perceived the role of the government engineer (in comparison with the Medical Health Officer) as that of a watchdog, a planner, a policy advisor, or an administrator; whereas the role of the consulting engineer (in comparison with the Public Health Inspector) was seen as that of a technical advisor on various specific questions."⁹

The Public Health respondents were also asked to identify their own role in the decision-making process relating to environmental quality in terms of advisory or representational capacities. Their image of their role was surprisingly ambiguous. Only ten percent saw themselves as clear-cut decision-makers and only another twenty-five percent considered themselves advisors. The remaining sixty-five percent of the respondents viewed themselves as straddling two spheres of competence, described by Snyder,¹⁰ in

9. Sewell, loc. cit.

10. Richard C. Snyder, "A Decision-Making Approach to the Study of Political Phenomena," in Roland Young, ed., Approaches to the Study of Politics (Evanston, Ill.: Northwestern University Press, 1958), pp. 25-27.

that depending on the physical, social and political implications of the issue at hand, their roles alternated between those of an advisory and of a decision-making role. Some "advise and then make a decision", others "decide and then advise", whilst others "make decisions when the M.H.O. is away". Similarly, although the engineer considered himself a "technical advisor" sixty percent of Sewell's group described themselves as "advisor-decision-makers".¹¹

Factor Analysis

Data relating to the forty-five variables concerning the role of Public Health professionals were factor analyzed, and five main factors were identified (Table 14). Factor I identified those who considered all water quality problems to affect the public's health and who felt, therefore, that such matters should be viewed as solely the responsibility of the Provincial Department of Health. This factor was designated as "Water Quality as a Health Problem"¹.¹² Some Public Health officers consult with their colleagues in their own Unit and at their Head Office much more frequently than others. This is reflected

11. Sewell, loc. cit.

12. See footnote 7. A similar occurrence, in that water quality is seen as a distinctive Department of Health problem, when the same information is included within a different group of data analyzed and therefore within a different context (Infra., Table 15, Factor IV, p. 203).

TABLE 14

DETERMINATION OF DEPENDENT VARIABLES:
ROLE OF PUBLIC HEALTH

Variables	I	II	III	IV	V
1. M.H.O. better equipped (Y/N)	*	*	*	-0.407	*
2. Dept. of Health: (all)	0.847	*	*	*	*
3. (sewage)	-0.847	*	*	*	*
4. (garbage)	-0.805	*	*	*	*
5. (recreational)	-0.511	*	*	-0.307	*
6. (industrial & commercial)	*	-0.358	*	0.318	-0.361
7. (drinking water)	-0.349	*	*	*	*
8. Groups concerned with env. qual: (health)	*	*	-0.357	*	*
9. Time allot. to water respons.: (actual)	*	*	*	*	*
10. (ideal)	*	-0.348	*	*	*
11. Organize groups (Y/N)	*	*	*	0.356	*
12. Business trips:					
Victoria (no. of times)	*	0.735	*	*	*
13. (training)	*	*	*	*	*
14. (consultations)	*	*	*	*	*
15. (meetings & conferences)	*	0.867	*	*	*
16. U.B.C. & Vancouver (no. of times)	-0.376	*	*	*	*
17. (training)	*	-0.317	*	*	-0.411
18. (consultations)	-0.511	*	*	*	0.313
19. (meetings & conferences)	*	*	*	*	*
20. Other H.U. in B.C. (no. of times)	*	*	*	*	*
21. (training)	*	*	*	*	*
22. (consultations)	*	*	*	*	*
23. (meetings & conferences)	-0.462	*	*	*	*
24. Outside B.C. (no. of times)	*	*	0.952	*	*

Table 14 (cont'd.)

Variables	Factor Loadings				
	I	II	III	IV	V
25. Outside B.C. (training)	*	0.341	*	*	*
26. (consultations)	*	*	0.771	*	*
27. (meetings & conferences)	*	*	0.796	*	*
28. No. of groups as P.H. representative	*	*	*	*	*
29. M.H.O. Role: (physician)	*	*	*	*	*
30. (health administrator)	*	*	*	*	0.754
31. (civic official)	*	*	-0.330	*	-0.606
32. (leader or co- ordinator of com- munity health affairs)	*	*	0.441	*	*
33. (health educator)	*	*	*	*	*
34. Fair appraisal of job: (Y/N)	*	*	*	*	*
35. (general practitioner)	*	*	*	*	*
36. (prevents communicable diseases)	*	*	*	*	*
37. (watchdog, regulator, enforcer)	*	*	*	*	*
38. (educator)	*	*	*	*	*
39. (consultor & advisor)	*	*	*	*	-0.390
40. Consultations: (M.H.O.)	*	-0.600	*	-0.367	-0.453
41. (P.H.I.)	*	0.540	*	*	*
42. (Head Office)	*	*	*	*	*
43. Act as: (advisor)	*	*	*	-0.877	*
44. (decision-maker)	*	*	*	*	*
45. (advisor/decision- maker)	*	*	*	0.882	*
Eigen value	3.874	3.013	3.257	2.829	2.419
Percent Cumulative Common Variance	.086	.153	.225	.288	.343

*statistically insignificant

by data on visits of such officials to Victoria and consultations between Medical Health Officers and Public Health Inspectors. Factor II is designated, therefore, as "Intra-Agency Consultation". In contrast, Factor III identified those who tended to look beyond their provincial agencies for advice. Factor III was designated as "Extra-Agency Consultation". Public Health officials perceive their role mainly as advisors and decision-makers rather than merely one or the other. This is reflected in Factor IV, which was designated as "Advisor and Decision-maker". Factor V discriminates quite clearly among those who consider the role of the Medical Health Officer as a health administrator and not as a civic official or physician. The administrative rather than the medical or political implications of his job are emphasized. Factor V, is referred to then, as "M.H.O. as an Health Administrator".¹³

The Role of Government

General governmental responsibilities, as perceived by Public Health professionals, have been implied in various sections of the analysis thus far, in particular as that

13. This is a role also assigned to the Public Health professional by Dixon, who sees him as "the public health generalist of the future". James P. Dixon, "Development Problems of Official Services in Keeping Time with the Times," American Journal of Public Health, Vol. 47, part 2 (November, 1957), p. 18.

which relates to the Provincial Department of Health and the Public Health function within the system. However, it appeared that a more selected summary might highlight the principal elements of the various viewpoints presented. Twenty-three variables were selected for analysis (Table 15).

Discussion of the Data Collected

Among the levels of government concerned with environmental quality matters, municipal and local levels of government are much more involved than are the Provincial (other than Health agencies) or the Federal governments (Table 12). In some areas, though, the Department of Fisheries was mentioned as having some responsibilities. This was also emphasized by the agencies from whom the Public Health professional tends to seek advice and consultation. Most of them tend to look either to their Head Office in Victoria or to municipal councils, rather than to other provincial and federal agencies.

Public Health professionals view political factors as a force in those aspects of their job concerned with environmental quality. Of those whom the Public Health professional saw as opposing forces, politicians were noted by nearly sixty percent of the respondents. Many felt that political interests in large corporations and in-

TABLE 15

DETERMINATION OF DEPENDENT VARIABLES:

ROLE OF GOVERNMENT

Variables	Factor Loadings			
	I	II	III	IV
1. Dept. of Health (all)	0.786	*	*	*
2. (sewage)	-0.916	*	*	*
3. (garbage)	-0.892	*	*	*
4. (recreational)	-0.600	*	*	*
5. (industrial and commercial)	*	*	*	-0.746
6. (drinking water)	-0.544	*	*	0.363
7. P.C.B.: (all)	*	*	*	-0.358
8. (garbage)	*	*	*	*
9. (recreational)	*	*	*	*
10. (industrial and commercial)	-0.888	*	*	*
11. Adequate legislation (Y/N)	*	*	*	*
12. Criteria: (sampling & testing facilities)	*	*	*	*
13. (enforcement & control legislation)	*	*	0.785	*
14. (local uses)	*	0.804	*	0.314
15. (bacteriological criteria)	*	0.611	*	*
16. (chemical criteria)	*	-0.826	*	*
17. Groups concerned with environmental quality: (civic officials)	*	*	*	*
18. (health officials)	0.313	0.344	*	*
19. (provincial & federal agencies)	*	*	*	*
20. Consultations: (Head Office)	*	*	0.566	*
21. (other provincial & federal agencies)	*	*	*	0.681
22. (municipal councils)	*	*	-0.682	*
23. Opposition: (politicians)	*	*	*	*
Eigen value	3.973	1.951	1.806	1.581
Percent Cumulative Common Variance	.173	.258	.337	.406

*statistically insignificant

dustries, not only made the enforcement of water quality programmes difficult but also that provincial budget policies placed Environmental Health as a relatively low priority.

Problems resulting from the division of responsibilities between the Department of Health and the Pollution Control Board, and the adequacy of criteria and legislation were emphasized in this connection too.

Factor Analysis

Four factors which together explained over forty per cent of the variance in this set of data were identified (Table 15). Factor I indicates quite clearly those people who consider "Water Quality a Health Problem²". The need for governmental definition and re-evaluation of "More Meaningful Water Quality Parameters²" was indicated by Factor II. Those who consulted heavily with provincial officials, rather than municipal officials, and who were concerned with more appropriate governmental legislation in determining water quality were discerned by the loadings of Factor III ("Provincial vs. Municipal Consultations"). The final variable derived in this set of data, suggested a grouping of individuals who did look to other provincial and federal agencies, such as the Department of Fisheries, the Department of Lands, Forests and Water Resources, and

the Department of Recreation and Conservation, for consultation. These professionals were strongly related to those who felt that the Pollution Control Board rather than the Department of Health be held responsible for issues involving the discharge of industrial and commercial effluents. This factor is referred to briefly as "Consultations with other Provincial and Federal Agencies".

Summary

Decisions relating to water quality management in British Columbia are the result of the complex interaction of many factors. It appears, however, that at least insofar as such decisions are made by Public Health professionals, perceptions and attitudes relating to problems, solutions, and roles play a very critical part in determining outcomes.

The results of the analyses undertaken in connection with this Chapter show that the Public Health professional perceives water quality management problems as being highly important among the various problems faced by society. However, water quality problems and solutions to them are viewed mainly in terms of physical health considerations. Most of the respondents felt that present legislation and standards were inadequate to deal with emerging problems,

either in terms of content or in terms of actual enforcement.

The Public Health official views his role in water quality management as being a key one. This is partly because he believes that water quality problems are mainly health problems, and partly because no agency other than his has expressed such continuous and overt concern about environmental quality. He believes he is better equipped than other professionals to handle water quality problems, and believes that the public respects his judgment in these matters. He is aware of interest and influence of other participants in the decision-making process, but the extent to which these are taken into account varies, considerably. For the most part consultation is with colleagues within the region, and at Head Office. Views of the lay public are sometimes sought but not in any systematic fashion.

The Public Health official sees himself either as an advisor or a decision-maker, or as a combination of both. He views his decision-making role, however, as quite limited; it relates mainly to administering policy or laws that have already been established.

Factor analyses was used to summarize and identify various factors that appear to be associated with the perceptions and attitudes of Public Health professionals in water quality management, and with various background

characteristics of such professionals. Some twenty-one factors were isolated in connection with their perceptions and attitudes, and another five factors were distinguished in reference to given background characteristics (Table 16). The information so derived was then subjected to further statistical analysis.

TABLE 16

DETERMINATION OF INDEPENDENT AND DEPENDENT VARIABLES

A SUMMARY LISTING

Independent Variables:Background and Professional Characteristics

1. Medical Health Officer/Public Health Inspector (M.H.O./P.H.I.).
2. Rank and Mobility
3. Years in Public Health

Views Toward the Environment

4. Nature over Man
5. Man over Nature

Dependent VariablesPerception of Problems

1. Multiple Quality Criteria
2. Pesticides, Noise and Purification
3. Environmental Quality and Sewage Disposal
4. Broad Perspective

Perception of Solutions

5. Improved Facilities
6. Improved Administration and Standards
7. More Meaningful Water Quality Parameters¹
8. Adequate Legislation

Role of Public

9. Dissatisfaction with Role of Public
10. Satisfaction with Role of Public
11. Opposition from Vested Interests
12. Organize Groups

Role of Public Health

13. Water Quality as a Health Problem¹
14. Intra-Agency Consultation
15. Extra-Agency Consultation
16. Advisor and Decision-maker
17. M.H.O. as an Health Administrator

Role of Government

18. Water Quality as a Health Problem²
19. More Meaningful Water Quality Parameters²
20. Provincial vs. Municipal Consultations
21. Consultations with other Provincial and Federal Agencies.

CHAPTER 9

FACTORS UNDERLYING PERCEPTIONS AND ATTITUDES
OF PUBLIC HEALTH PROFESSIONALS

Public Health professionals perceive water quality management problems and the solutions to them in a number of ways. They also have particular attitudes as to who is responsible for initiating action for dealing with such matters, and as to what role each of the various participants should play in decision-making. Chapter 7 identified some of the background characteristics of Public Health professionals, and Chapter 8 described their perceptions of problems and solutions, and their views as to the roles of various groups. It now remains to determine the extent to which variations in perceptions and attitudes can be accounted for by variations in background and other personal and educational characteristics. Various statistical techniques might be used for this purpose but step-wise multiple regression seemed most appropriate. The method based on the Student's t test was selected for this study.

This part of the analysis consisted of three main phases: first, the identification of a group of independent and dependent variables; second, correlation of the group of independent variables with each of the dependent variables; and third, correlation of the group of dependent

variables with each of the independent variables.

The independent variables were identified from the factor analyses of background data described in Chapter 7. Five such variables were discerned as follows (Table 16):

- (i) Medical Health Officer/Public Health Inspector (M.H.O./P.H.I.)
- (ii) Rank and Mobility
- (iii) Years in Public Health
- (iv) Nature over Man, and
- (v) Man over Nature.

The group of dependent variables was derived from twenty-one factors identified in the factor analyses in Chapter 8, concerning perceptions of problems and solutions, and of roles of various groups in initiating action. The twenty-one factors are listed in Table 16. Five groups of factors can be distinguished within this list. These are as follows:

- (i) Perception of Problems
- (ii) Perception of Solutions
- (iii) Role of the Public
- (iv) Role of Public Health, and
- (v) Role of the Government.

Having identified the two groups of variables, the next task was to determine the nature of relationships and the extent to which a given variable could explain variations in another group of variables. The first step was

to examine the influence of the various dependent variables on the independent variables.

The Relationship Between Perceptions and Attitudes
And Characteristics of Decision-Makers

One of the basic hypotheses of the study was that the way in which professionals perceive problems and solutions is influenced to an important extent by their background characteristics and experience. Generally, the results of the study seem to bear this out.

Perception of Problems

The perception of problems appear to be mainly a function of length of service in Public Health, and the number of positions held in the field. Some thirty-two percent of the variance relating to perceptions of problems is accounted for by these factors (Appendix G, Table 1)¹. Other factors such as Man's relationship with Nature do not appear to be significant influences in this connection.

Perception of Solutions

Public Health officials perceive a variety of possible solutions to water quality management problems. Some see the solution in improved legislation, others in better

1. It was considered that due to the nature of the results, in the first phase of step-wise multiple regression analyses, it did not appear appropriate to labour the text with undue tables. However, the findings are listed in Tables 1 to 5 in Appendix G for reference purposes.

facilities. Yet others believe that problems can only be solved by the establishment of more reliable sampling criteria. Reasons for such variations in perceptions are not readily apparent. They seem to have relatively little relationship with background characteristics and experience. The results of the regression analysis (Appendix G, Table 2), reveal that the latter considerations account for only a small part of the variance in perceptions of solutions. Years in Public Health, for example, accounts for only ten percent of the variance in views as to the adequacy of present legislation. Other dependent variables considered do not make any worthy addition in explaining such differences either.

Attitudes as to the Responsibility for Action

The remaining thirteen dependent variables were concerned with attitudes as to responsibility for initiating action to deal with water quality problems. Briefly, such attitudes concerned the role of the public, Public Health, and government in initiating such action.

The Role of the Public

The Public Health professionals interviewed tended to have four main views about the role of the public in water quality management. Such views reflected in part

the kind of support or opposition that they saw, or had experienced as a result of, public involvement in water quality management. Some viewed public involvement through organized groups in a favourable light, especially where there seemed to be a genuine search for improved environmental quality. Others, however, saw such involvement as unfavourable, and in some cases a threat. For the most part, views of this group appeared to be based upon "the nuisance which well-meaning, but ill-informed people can cause in getting involved in complex problems like water quality." A third group was much more specific in its opposition to public involvement, pointing out the ways in which certain groups opposed action which was in the public interest in order to promote private interests. Industrialists and land developers were singled out as often holding views contrary to the public interest. A fourth group was extremely concerned that the public should participate in decisions relating to the environment, and felt it was the duty of Public Health professionals to encourage this, such as through the establishment of Conservation groups or Anti-pollution groups.

Here again it was difficult to account for variations in views although there were instances of a strong inter-relationship between variables (Appendix G, Table 3). The younger and less experienced Public Health officials appeared to be the least satisfied with public involvement,

accounting for seventeen percent of the variance in "Dissatisfaction with Role of the Public". Such dissatisfaction also seemed to be characteristic of those who viewed Man as being in control of Nature.

The view that public participation is useful appeared to be associated with views that Nature is in control of Man. This variable accounted for some six percent of the variance. No other factor, however, seemed to be statistically significant.

In the case of concern about the divergence between private and public interests, the only related factor appeared to be "Man over Nature". However, no significant variable was revealed to account for the views in reference to Public Health officials' responsibilities to organize public Anti-pollution groups.

The Role of Public Health

Public Health professionals tend to view water quality problems largely in terms of effects on human health. As a consequence, they regard their role in water quality management as being extremely important. There are variations, however, in their perceptions as to what precisely this role should be, some viewing it in relatively narrow terms and others in very broad terms. The reasons for the variations are not readily apparent, and regression analysis did not offer many clues (Appendix G, Table 4).

Few of the factors considered explained much of the variance, with the exception of the specification of whether the respondent was a Medical Health Officer or a Public Health Inspector. In one case views appeared to depend somewhat upon whether the official viewed his role a dual one, that of an advisor and a decision-maker. The distinction between the two types of professionals involved explained some twenty-one percent of the variance. Furthermore, it accounted for over fifty percent of the difference in views as to the nature of their seeking "Intra-Agency Consultation".

The Role of Government

The Public Health officials seemed to be in broad agreement that government had an extremely important role to play in dealing with water quality problems. There were variations, however, in views as to what this role involved, and which levels of government should assume which responsibilities. The independent variables considered in the study did not provide much guidance as to the reasons for such variations (Appendix G, Table 5).

In summary, it is evident that Public Health professionals perceive water quality problems and solutions in a variety of ways. They also have differing views as to the role of the public, Public Health, and the government in dealing with these problems. Analyses based upon an

examination of the influence of a group of independent variables upon each of the twenty-one dependent variables did not provide a satisfactory explanation of variations in perceptions and attitudes. The results indicated that only in a few instances could a substantial and valid portion of the variance be accounted for by one or more of the independent variables. An alternative approach of investigation, therefore, was adopted.

In essence, its purpose was to establish a summary recognition of the influence of factors upon perceptions and attitudes, still employing step-wise multiple regression techniques of analysis. This involved examining each of the independent variables in turn and attempting to define not only the nature of the relationship, but also to determine the extent to which each influenced particular perceptions or attitudes, identified in the twenty-one dependent variables. For instance, it attempted to determine the extent to which rank and mobility of Public Health officials accounts for variations in attitudes as to the appropriate role of the government in dealing with such matters. This analysis proved to be more distinct in its attempt to isolate factors underlying perceptions and attitudes. The results are summarized in Tables 17 to 21.

The Influence of Background Characteristics on
Perceptions and Attitudes

The second approach was considerably more successful in distinguishing explanations of variations in perceptions and attitudes. Because of the difficulty of identifying influences upon human behaviour, the explained variance, as noted in Chapter 8, in studies relating to the latter is often low. However, levels of thirty percent or below have sometimes been viewed as acceptable. In the second approach it was possible to account for as much as seventy percent of the variance in the data.

Medical Health Officer/Public Health Inspector
(M.H.O./P.H.I.)

The distinction between the position of the Medical Health Officer and that of the Public Health Inspector has an important influence upon perceptions of problems and solutions, and upon attitudes as to responsibilities. In particular, it explains variations in attitudes as to the role of particular participants in decision-making. As Table 17 indicates, views that relationships with Head Office are important, that Public Health professionals are both advisors and decision-makers, and that public involvement is often unsatisfactory, are held more by Medical Health Officers than by Public Health Inspectors, and the distinction between these two groups accounts for almost

TABLE 17

MULTIPLE REGRESSION ANALYSIS: INFLUENCE OF INDEPENDENT VARIABLE

(22) MEDICAL HEALTH OFFICER/PUBLIC HEALTH INSPECTOR (M.H.O./P.H.I.)

Dependent Variable Entering the Equation	Sign	R	2. R	Increase 2 in R	T-value		Level of Significance
					To Enter Equation	In Final Equation	
14. Intra-Agency Consultation	+	.724	.524	.524	6.476	6.580	.005
16. Advisor and Decision-maker	+	.755	.570	.046	1.964	3.115	.005
11. Opposition with Vested Interests	+	.772	.596	.026	1.517	0.713	*
9. Dissatisfaction with Role of Public	+	.786	.618	.022	1.455	1.868	.05
15. Extra-Agency Consultation	-	.796	.634	.016	1.158	1.216	.10
5. Improved Facilities	+	.802	.643	.010	1.003	2.319	.025
3. Environmental Quality and Sewage Disposal	+	.811	.658	.015	1.132	1.064	*
20. Provincial vs. Municipal Consultations	-	.818	.669	.011	1.021	1.290	.10
19. More Meaningful Water Quality Parameters ²	+	.828	.686	.017	1.264	1.469	.10
7. More Meaningful Water Quality Parameters ¹	+	.835	.697	.012	1.085	1.085	*

* statistically insignificant.

seventy percent of the variance in their perceptions and attitudes relating to water quality management.

It can also be noted that the attitude that persons beyond the Agency should be consulted and that opinions of provincial rather than municipal agencies should be sought, is characteristic of Public Health Inspectors rather than Medical Health Officers. The distinction between the two groups, although significantly related, only accounts for about three percent of the variance in these attitudes.

Rank and Mobility

The rank and mobility of Public Health officials also has an important influence upon perceptions and attitudes. As Table 18 indicates, more than fifty percent of the variance in six variables is explained by considerations of rank and mobility. It appears that the older the official, the broader his experience. The higher his rank, and the more he has transferred from one post to another, the more he tends to organize Anti-pollution committees. This seems to confirm the general impression gained in the study, that Public Health professionals are highly committed to their work, and regard it as a vocation rather than a job but that they often see the problems with which they deal in a rather narrow context, namely that of physical well-being.

TABLE 18

MULTIPLE REGRESSION ANALYSIS: INFLUENCE OF INDEPENDENT VARIABLE

(23) RANK AND MOBILITY

Dependent Variable Entering the Equation	Sign	R	R ²	Increase in R ²	T-value		Level of Significance
					To Enter Equation	In Final Equation	
4. Broad perspective	-	.514	.264	.264	3.695	5.041	.005
3. Environmental Quality and Sewage Disposal	+	.580	.336	.072	2.008	2.089	.025
12. Organize Groups	+	.631	.398	.062	1.913	2.520	.02
16. Advisor and Decision-maker	-	.667	.445	.047	1.713	1.609	.10
8. Adequate Legislation	+	.695	.483	.038	1.607	1.731	.05
9. Dissatisfaction with Role of Public	-	.717	.514	.031	1.452	1.510	.10
2. Pesticides, Noise, and Purification	+	.728	.530	.016	1.037	1.037	*

* statistically insignificant.

Years in Public Health

The longer an official has been in Public Health service, the more 'adjusted' he tends to become to his institutional and physical environments (Table 19). Concern about environmental quality, tends to decline with the number of years devoted to the profession, so also does dissatisfaction with the present public involvement in decision-making, the tendency to consult with persons outside the Agency, and concern about the effectiveness of administrative arrangements, or the validity of water quality standards. A possible interpretation of these trends is that increasing experience in the Public Health Service tends to make one less willing to promote administrative or legislative change or to question the conventional wisdom. It is mainly the younger, less experienced professionals who are the most critical of present policies and procedures. This is, of course, a characteristic of almost any profession.

Years spent in Public Health appears to be a good predictor of variations in perceptions and attitudes. As indicated in Table 19, this independent variable explained more than sixty-four percent of the variance in ten significant dependent variables.

Man's Relationship with Nature

Views about Man's relationship, particularly his

TABLE 19

MULTIPLE REGRESSION ANALYSIS: INFLUENCE OF INDEPENDENT VARIABLE

(24) YEARS IN PUBLIC HEALTH

Dependent Variable Entering the Equation	Sign	R	R ²	Increase in R ²	T-value		Level of Significance
					To Enter Equation	In Final Equation	
3. Environmental Quality and Sewage	-	.423	.179	.179	2.874	3.511	.005
9. Dissatisfaction with Role of Public	-	.585	.342	.163	3.041	2.176	.025
15. Extra-Agency Consultation	-	.633	.401	.059	1.868	2.714	.005
6. Improved Administration and Standards	-	.674	.454	.054	1.840	2.735	.005
12. Organize Groups	-	.706	.498	.044	1.737	1.660	.10
16. Advisor and Decision-maker	+	.727	.529	.030	1.475	1.672	.05
14. Intra-Agency Consultation	-	.748	.560	.031	1.474	1.781	.05
21. Consultations with other Provincial and Federal Agencies	+	.766	.587	.027	1.453	2.250	.025
2. Pesticides, Noise, and Purification	-	.786	.618	.031	1.546	1.437	.10
17. M.H.O. Role as an Health Administrator	-	.802	.643	.025	1.426	1.426	.10

technological relationship, with Nature also appear to influence perceptions and attitudes relating to water quality management. Those Public Health professionals who regard water quality as a health problem, those who are not dissatisfied with public involvement and those who express a deep concern about pesticides, noise and water purification tend to hold the view that Nature is in control of Man (Table 20).

The view that Man is in control over Nature, however, is a much better predictor of perceptions and attitudes, accounting for forty-seven percent of the explained variance in nine significant variables, as indicated in Table 21. Those who held this view tended also to feel that consultation beyond the Public Health Unit is not especially critical, that public involvement often leads to unsatisfactory results, that present water quality criteria are valid, and that pesticide, noise, and water purification problems are not a matter for great concern. One interpretation of these results might be that the Public Health professional not only sees Man in control of Nature, but also that he sees his official role as occupying an especially vital position in helping Man to deal with and overcome problems involving the physical environment. Possessing the necessary kind of training, understanding the problems better than others, and possessing a strong vocational commitment to his work, the Public Health official may feel that water quality management can be left safely within

TABLE 20

MULTIPLE REGRESSION ANALYSIS: INFLUENCE OF INDEPENDENT VARIABLE

(25) NATURE OVER MAN

Dependent Variable Entering the Equation	Sign	R	R ²	Increase in R ²	T-value		Level of Significance
					To Enter Equation	In Final Equation	
9. Dissatisfaction with Role of Public	-	.315	.099	.099	2.045	1.424	.10
18. Water Quality as a Health Problem ²	+	.412	.170	.071	1.771	1.852	.05
8. Adequate Legislation	-	.492	.242	.072	1.858	1.179	*
2. Pesticides, Noise, and Purification	-	.522	.273	.030	1.209	1.412	.10
15. Extra-Agency Consultation	+	.547	.299	.027	1.142	1.050	*
6. Improved Administration and Standards	-	.565	.319	.020	0.964	1.058	*
14. Intra-Agency Consultation	+	.580	.336	.017	0.933	.898	*
11. Opposition from Vested Interests	-	.591	.349	.013	.785	.785	*

* statistically insignificant

TABLE 21

MULTIPLE REGRESSION ANALYSIS: INFLUENCE OF INDEPENDENT VARIABLE

(26) MAN OVER NATURE

Dependent Variable Entering the Equation	Sign	R	R ²	Increase in R ²	T-value		Level of Significance
					To Enter Equation	In Final Equation	
15. Extra-Agency Consultation	-	.352	.124	.124	2.316	3.386	.005
19. More Meaningful Water Quality Parameters ²	-	.462	.213	.090	2.050	1.627	.10
3. Environmental Quality and Sewage Disposal	+	.536	.287	.074	1.930	2.196	.025
11. Opposition with Vested Interests	-	.586	.343	.056	1.727	2.139	.025
16. Advisor and Decision-maker	-	.624	.389	.046	1.600	1.672	.05
10. Satisfaction with Role of Public	-	.642	.412	.023	1.153	1.416	.10
2. Pesticides, Noise, and Purification	-	.658	.433	.021	1.089	1.457	.10
4. Broad Perspective	+	.674	.454	.021	1.088	1.157	*
13. Water Quality as a Health Problem ¹	+	.683	.467	.012	0.843	1.647	.10
18. Water Quality as a Health Problem ²	-	.706	.498	.032	1.365	1.401	.10
6. Improved Administration and Standards	-	.717	.514	.016	0.911	0.911	*

his responsibility. Where other agencies, or certain pressure groups become involved, the courses of action which he would recommend might become so modified as to prevent the problem being solved at all.

Summary

In summary, multivariate analyses, and in particular step-wise multiple regression analysis provided some valuable insights as to the influence of various factors on perceptions and attitudes relating to water quality management. Correlation of the group of independent variables with each of the twenty-one dependent variables indicated that the length of service in Public Health and the number of positions held appear to have an important influence upon the perception of problems. There are considerable variations in perceptions of solutions and in attitudes as to the appropriate role of various groups in decision-making. Explanations for such variations were not found in the first phase of the analysis.

The second phase of the analysis, however, did reveal some useful indications as to the importance of particular factors upon various perceptions and attitudes. It showed that the distinction between the Medical Health Officer and the Public Health Inspector, derived in terms of professional training and experience, rank and mobility, years

in Public Health, and views relating to Man's relationship with Nature are all significantly revealing in explaining variations in particular perceptions and attitudes. Of particular interest in this connection are the findings disclosed of the variations in perceptions and attitudes not only within the group of Public Health officials as a whole, but also that which related directly and implicitly to each of the two sub-groups of professionals involved - the medical administrator and the sanitary engineer. Furthermore, the data revealed evidences of a significant and substantial relationship between years in Public Health and views as to the role of the Public Health official and the role of others in environmental quality matters. It appears that the longer the professional has been in the Service, the more adjusted he becomes to the institutional, or behavioural environment within which he works. Not only is he less prone to criticize the administrative framework, legislation or policies, but he also becomes more firmly convinced that his own role is a critical one and that of his Public Health agency are the most important of the various agencies involved in water quality management.

CHAPTER 10
AN OVERVIEW

Professionals have played an important role in decision-making in matters relating to resources management in Canada, whether as technical advisors, administrators, or advocate planners. The role of particular types of professionals, however, tends to change over time. The specific role at a given point in time is largely a reflection of such factors as the problems to be dealt with, the perceived need for particular types of expertise, and perceived social and political goals.

Some insights into the present and potential role of particular groups of professionals can be gained from studies of their perceptions and attitudes, and their patterns of decision-making. Despite a considerable expansion of research relating to the behavioural dimensions of resource management and public policy in the past five years, there remain significant gaps in understanding of the following:

1. The perceptions and attitudes of various individuals and groups of persons involved in resources management.
2. Factors underlying these perceptions and attitudes; and
3. The influence of perceptions and attitudes on the decision-making process.

This study focussed upon one professional group, Public Health officials, involved in water quality management. Some attempt was made to explore each of the matters outlined above. A conceptual framework was outlined, noting the nature of the decision-making network and assuming ways in which attitudes and perceptions influence the decision-making behaviour of individuals within it. The major hypothesis was:

The ways in which Medical Health Officers and Public Health Inspectors perceive water quality problems and their solutions, and the ways in which they perceive their role and the role of others in taking action are principally a reflection of professional and biographical factors.

The research findings generally supported this hypothesis. It indicated that the perceptions and attitudes of Public Health professionals differed in important ways from another important group of professionals involved in water management, namely engineers.¹ It also indicated that there are significant differences in perceptions

1. W. R. Derrick Sewell, "The Role of Attitudes of Engineers in Water Management," in Fred L. Strodbeck and Gilbert F. White, eds., Attitudes Toward Water: An Interdisciplinary Exploration (Chicago, Ill.: University of Chicago, Social Psychology Laboratory and Department of Geography, unpublished manuscript, January, 1970).

and attitudes within professional groups, as between Medical Health Officers and Public Health Inspectors, and between government engineers and consulting engineers.

As noted in Chapters 8 and 9 a number of factors were found to have varying influences on the ways in which they perceived problems and suggested solutions to them, and their attitudes as to the roles of various groups in the decision-making network. These findings add to knowledge of perceptions of environmental problems, and attitudes as to responsibilities for dealing with them. They also improve understanding of the factors which influence such views.

It must be emphasized that the study was not intended to be either definitive or comprehensive. Much remains to be learned about the perceptions and attitudes of professionals in general and Public Health officials in particular. The connection between perceptions, attitudes, personality, and decision-making behaviour still remains a largely uncharted area.

Variations in Perceptions and Attitudes Of Public Health Professionals

The study furnished some valuable insights into the way in which one particular group of professionals perceived its own role and that of others in environmental

quality management. As shown in Chapters 8 and 9, variations in perceptions and attitudes appeared to be a reflection particularly of age, experience, and of the specific status of the respondent (i.e. whether he was a Medical Health Officer or a Public Health Inspector).

The older, more experienced officials, for example, appeared to be more convinced of their importance in the decision-making process. Generally, they had fairly narrow perceptions of the problems to be faced, and the solutions that might be applied. They were critical of the lack of application of laws and standards, rather than the underlying principles. In contrast, the younger, less experienced professionals, were prone to critically appraise the foundations of the present framework, the principles underlying water quality criteria, and the relevance of the solutions typically adopted. They also wished to involve people in addition to Public Health officials in the decision-making process. They were more aware of the changing nature of problems, and of changing social values, as expressed, for example, in the desire for increased public participation. The difference in viewpoints of the two groups appeared to be related to differences in their education and training, their experiences with the environment beyond the professional context, and their attitudes toward the role of technology in the Man-Nature relationship.

Perceptions, Attitudes and Decision-Making

For the most part the Public Health officials perceived water quality problems in terms of potential impacts on human health. The solutions suggested were generally described in terms of the imposition of standards or regulations, the construction of facilities, such as sewers or water supply reservoirs, or the development of public education programmes. Generally the Public Health officials perceived their own role as being especially important in identifying problems and in devising and implementing solutions.

Comparison of these views with actual decisions or recommendations made by the officials in particular water quality management situations showed that there was a close connection between views and behaviour. In addition, it was found that there are relationships between views that are not directly related to an issue and the decisions or behaviour concerned with it. Certain personality characteristics, which have been molded perhaps by past experiences and inherent psychological and genetic factors, appeared to have an important influence on decision-making behaviour. Illustrative of this were the views expressed concerning Man-Nature relationships, Man's technological capabilities, and the ranking of general problems to be faced by society.

Implications of the Findings

The findings of the study have implications both for research relating to the human adjustment to the environment, and for public policy concerning environmental quality. The study substantiated some of the findings of other studies relating to Public Health officials, but also indicated some differences. Most important, it describes the characteristics of one particular group of officials, not studied hitherto in a problem-solving context. There remain some important gaps in the understanding of perceptions and attitudes of such officials. First, there is a need for further understanding of the factors that account for variations in perceptions and attitudes between divisions within a given profession, and between particular professions. Second, research is required to determine the extent to which perceptions and attitudes vary between areas. Third, further enquiry is needed to determine the extent to which perceptions and attitudes account for variations in decision-making behaviour. This latter research will require the development of an improved body of theory as well as empirical investigations to test relationships.

The findings of the study also have some important implications for public policy relating to environmental quality management. It is evident that perceptions and attitudes of Public Health officials differ from views of

other groups, as revealed in technical journals and in the popular press, particularly as to the nature of the problems to be dealt with, the solutions that might be applied, and as to the appropriate role of various participants in the decision-making process.² The implication is that some problems may not be dealt with, that the range of solutions applied may be unnecessarily narrow, and that public views may be given insufficient attention.

The responsibility for water quality management in the past has been largely in the hands of the Public Health professional, because it was considered mainly a physical health problem. It thus became institutionalized in the Department of Health. Even though a separate Pollution Control Board has been created in the province

2. Economists, for example, tend to view the problem of environmental quality as a natural consequence of the production and consumption processes, and as such a matter that can be dealt with through the application of the market mechanism. See, for example, J.H. Dales, Pollution, Property and Prices (Toronto, Ont.: University of Toronto Press, 1969); biologists typically see the problem as the intervention of Man into the delicate web of Nature, and generally suggest as a solution the prohibition of those activities that appear to be responsible for causing the imbalance; while political scientists see the problem as one which has little political importance until it reaches crisis proportions, and typically view the solution as being the enactment of legislation, or the re-organization of the administrative framework. Viewpoints of various professional and other groups are set out in such works as Garrett de Bell, The Environmental Handbook (New York: Ballentine Books, Inc., 1970); Harold W. Helfrich, Jr., The Environmental Crisis (New Haven, Conn.: Yale University Press, 1970); and Paul Ehrlich, et. al., "The Crisis of Survival," Symposium Issue of The Progressive, Vol. 34, No. 4 (April, 1970).

there is as yet no concensus as to whether such an agency is required or, if it is, precisely what its functions ought to be. More important, there is little agreement as to how broader questions of environmental quality management ought to be handled. Should there be an overall Environmental Control Agency, or a co-ordinative mechanism bringing together various agencies involved in different aspects of environmental quality management?³ Answers to such questions will have important bearing upon the future role of Public Health officials in this field.

The findings of the study have another important implication for the future role of the Public Health professional. The results showed that some of the officials

3. Caldwell has made special claim to such a proposal. He states: "Fragmented action and policies affecting natural resources and human environment have brought waste and confusion in their train and are a result of the lack of recognition of environment as a general subject for public action. The human and historical reasons for this, although strong, can be overcome. However, to change this behavior, to obtain integrated planning and action, and to get coordination among the agencies and policies affecting environment a new policy focus will be required. What is this new policy focus? Does it imply environmental administration?" See Lynton K. Caldwell, "Environment: A New Focus for Public Policy?" Public Administration Review, Vol. 23 (1963), p. 132.

were not especially anxious to involve either the general public or other agencies, except in a rather cursory consultative capacity. "Public involvement", suggested one of them, "makes decision-making cumbersome and inefficient, and perhaps even impossible." In addition, most of the Public Health officials were convinced that they should occupy the key professional role in dealing with environmental quality problems. Not only do they seldom consult with other types of professionals, but also they are highly skeptical of the potential contribution of the latter in such matters.

It is clear, however, from the emergence of numerous protest organizations in the past few years, the growing number of letters to the Editors of newspapers, the increasing popularity of environmental questions on "phone-in" shows, and increasing attendance at public meetings that the public wishes to be consulted and become more involved in decision-making. It is no longer content to leave decisions in this field to the bureaucracy, nor to have particular questions considered in isolation from broader matters of public concern.⁴

It is also evident that the nature of the environmental quality problem has broadened considerably. No longer is it solely a matter of disease control, but rather one

4. See Canada, Task Force on Government Information, To Know and To Be Known (Ottawa: Queen's Printer, 1969), 2 vols.

embracing mental health as well as physical health, and human welfare in general. Modern society is no longer faced only with problems of privy inspection and rat catching, but also with the decline of open space, the effects of the combustion engine, and the supersonic boom. Such problems clearly go far beyond the traditional concept of matters to be dealt with by the Public Health official. His future role in the management of environmental quality, therefore, will depend in part on the extent to which his profession and the administrative framework within which he works can adapt to the broadening scope of the problem and to changing public views as to the goals to be sought, and the means that should be employed to attain them. With appropriate adaptation Public Health professionals and the agencies for which they work will continue to play a significant role in a field which they have helped to pioneer.

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APPENDIX A

OUTLINE OF PUBLIC HEALTH PRACTICE IN BRITISH COLUMBIA

1. Maternal - pre-natal classes; home visits (pre- and post-natal).
2. Infant - home visits; child health conferences; immunization.
3. Pre-school - Child health conferences; screening (vision, speech, hearing); three-year-old assessment; home visits; kindergartens and nursery schools; day care centres; immunizations.
4. School - screening; referral; immunizations; health education.
5. Home Care
6. Communicable Disease Control - immunization programme.
7. Rheumatic Fever Programme
8. Poison Control Programme
9. Accident Prevention
10. V.D. Programme
11. T.B. Programme - mass X-ray screening
12. Special Need Areas - geriatrics; low income; ethnic
13. Cancer Control - diagnostic screening clinics
14. Chronic Disease
15. Rehabilitation Services
16. Screening Programmes - Cancer; P.K.U.; Hearing; Vision
17. Genetic Counselling
18. Selective Family Planning
19. Dental Services
20. Nutrition Services
21. Emergency Health Services

22. Registry for Handicapped Children and Adults and "At Risk" Registries
23. Laboratory Services - bacteriology; virology; blood
24. Mental Health
25. Occupational Health - factory inspections, employee health; pesticides, detergents, irradiation.
26. Speech Therapy
27. Biostatistics
28. Health Education - smoking; narcotics; alcohol; health curriculum in schools.
29. Sanitation and Environmental Control
 - (i) Eating and Drinking Places
 - (ii) Food Control
 - Bakeries and Bakeshops
 - Bottling Plants
 - Food Processing Plants
 - Food Stores
 - "Frozen" Food Locker Plants
 - Meat Inspections
 - Shellfish
 - Investigation of Food-borne Disease Outbreaks
 - (iii) Housing
 - Industrial Camps
 - Welfare Institutions
 - Summer Camps
 - Schools for Retarded Children
 - Kindergartens
 - Rooming Houses and Hotels
 - Tourist Accommodation
 - Improving, Closing and Demolishing
 - (iv) Sanitation General
 - Barbershops and Beauty Parlours
 - Comfort Stations (Public Rest Rooms)
 - Complaints
 - (v) Offensive Trades
 - Fur Farms
 - Poultry and Livestock Farms
 - Rendering Plants
 - Slaughterhouses.
 - (vi) Pest Control
 - Insects
 - Rodents

- (vii) Recreation
 - Carnivals and Fairs
 - Parks and Beaches
 - Swimming Pools and Wading Pools
- (viii) Schools
 - Environmental Sanitation
 - Kindergarten
- (ix) Sewage Disposal
 - Plumbing
 - Privies
 - Septic Tanks - (Faculty or Existing Installations)
 - Sewage & Waste Water Disposal where no sewer available
 - Public Sewage Systems
- (x) Town Planning
 - Building and Site Approvals
- (xi) Cemeteries and Crematoria
- (xii) Subdivision Approval
- (xiii) Waste Disposal
 - Industrial Wastes (Sawmills, Canneries, etc.)
 - Refuse Disposal
- (xiv) Water
 - Chlorination
 - Irrigation Systems
 - Laboratory Reports
 - Private Water Systems
 - Public Water Systems
 - Fluoridation
 - Cleaning and Disinfection of Wells
- (xv) Pollution Control
- (xvi) Hospital Infection
- (xvii) Factory Inspection
- (xviii) Training
 - Food Handlers
 - Water and Sewage Plant Operators

30. Health Centre Construction

31. Voluntary Health Agencies

Other Areas for Consideration

- Automation of records
- Staff utilization
- Administrative patterns
- Co-ordination and organization for delivery of care - levels, etc.
- Training and Education
- Research
- Public Health Morale
- Regionalization (Emergency Health Services: Laboratory Services)
- Cost/Benefit Analysis and Standardization of Records

WATER QUALITY PARAMETERS AND WATER USES

WATER QUALITY PARAMETERS WATER USES	1 ORGANISMS OF THE COLIFORM GROUP (MPN or equivalent MF., using a representative number of samples where associated with fecal sources.)	2 DISSOLVED OXYGEN mg/l or % satura- tion	3 pH (Natural pH con- ditions outside this range shall be maintained with- out change.)
A. WATER SUPPLY, DRINKING, CULINARY & FOOD PROCESSING (Without treatment other than simple disinfection and removal of naturally present impurities.)	Average less than 50 per 100 ml. in any month.	Greater than 75% saturation.	Between 6.5 and 8.5 Induced varia- tion shall be less than 0.5 pH unit.
B. WATER SUPPLY, DRINKING, CULINARY & FOOD PROCESSING (With adequate treatment equal to coagulation, sed- imentation, filtration, disinfection, and any additional treatment necessary to remove naturally present impurities.)	Average less than 2,000 per 100 ml. over any consecutive 30 days. Not more than 20% of samples examined during this period should ex- ceed 2,000 per 100 ml.	Greater than 60% saturation.	Between 6.5 and 8.5 Induced vari- ation shall be less than 0.5 pH unit.
C. BATHING, SWIMMING, RECREATION	Average less than 1,000 per 100 ml. with 20% of samples not to exceed 2,400 per 100 ml. Clear water lakes and upper areas of streams should average less than 240 per 100 ml. and not exceed this in more than 20% of samples.	Greater than 5 mg./l.	Between 6.5 and 8.5 Induced vari- ation shall be less than 0.5 pH unit.

APPENDIX B

	1	2	3
D. GROWTH AND PROPAGATION OF FISH AND OTHER AQUATIC LIFE (Including Waterfowl, Fur-bearers, and other Aquatic and Semi-Aquatic Life.)	Same as C-1 to protect associated recreational values.	Greater than 75% saturation at the diurnal and seasonal low. 100% saturation during spawning, hatching, and egg sac and swim-up fry stages and when water temperatures exceed 68°F (20°C) for cold-water fish and 85°F (29.5°C) for warm-water fish.	Between 6.5 and 8.5 Induced variations shall be less than 0.5 pH unit.
E. SHELLFISH GROWTH AND PROPAGATION	Not to exceed limits specified in the <u>NATIONAL SHELLFISH SANITATION PROGRAM MANUAL OF OPERATIONS</u> , USPHS.	Greater than six(6) mg./l. in the larval stage. Greater than five (5) mg./l. in the adult stage.	Between 7.8 and 8.5 Induced variation shall be less than 0.5 pH unit.
F. AGRICULTURAL WATER SUPPLY (Including Irrigation, Stock Watering, and Truck Farming.)	Average less than 1,000 per 100 ml. with 20% of samples not to exceed 2,400 per 100 ml. for livestock watering, for irrigation of crops for human consumption, and for general farm use.	Greater than 3 mg./l.	Between 6.5 and 8.5 Induced variation shall be less than 0.5 pH unit.
G. INDUSTRIAL WATER SUPPLY (Other than Food Processing.)	The requirements of C-1 should be met wherever worker contact is required.	Greater than 5 mg./l. (Not limiting except as it affects other parameters.)	Between 7.0 and 8.0 Induced variation shall be less than 0.5 pH unit.

APPENDIX B (cont'd.)

Qualitative and quantitative evaluation of water samples for comparison with these proposed standards should be made in accordance with the procedures set forth in the current edition of Standard Methods for the Examination of Water and Waste Water, published by the APHA, the AWWA and WPCF.

APPENDIX C

PRELIMINARY HYPOTHESES

HYPOTHESES TO BE TESTED AND INFORMATION REQUIRED

1. The way in which MHO¹ and PHI² perceive water problems³
(or environmental quality problems) is primarily a reflection

of:

- (a) their training and experience
- (b) their interpretation of their role in water management
- (c) the physical and human environment in which they work
- (d) the importance they attach to problems with which they deal compared with other problems to be faced by society.

Information required on:

- 1) The major problems to be faced in B.C. in the next decade.
- 2) The major water problems in B.C. and in your area.
- 3) Is pollution a major problem? If so where?
- 4) How do you tell when there is pollution
 - a) in a water body, such as a lake or river?
 - b) in the atmosphere?
- 5) Are there other kinds of pollution?
- 6) Sex
- 7) Age
- 8) Educational Background (including administrative training)
- 9) Previous experience and present work
- 10) Problems he has to deal with
- 11) People with whom he has to deal
- 12) Recreational interests
- 13) How do water problems rank with other problems faced by society?

- 14) Data on local physical and human environment
- 15) Experience with different kinds of water problems --
Floods, drought, pollution, etc.

2. The solutions to problems with which MHO and PHI deal are perceived by them mainly in terms of technical or medical considerations.

Information required on:

- 1) What are the solutions to problems of:
 - a) water pollution
 - b) air pollution
 - c) other pollution
- 2) The validity of the E-coli count criterion
- 3) The choice between several alternatives in a practical situation.

3. The courses of action recommended by MHO and PHI are mainly a reflection of:

- (a) their training and experience
- (b) their personality characteristics
- (c) the situation in which the decision is made (distinguishing between role as an advisor vs. actual decision-maker)
- (d) external forces.

Information required on:

- 1) Sex, age, educational background, extent of training (including admin.)
- 2) Previous experience
- 3) Personality characteristics
- 4) Types of situations when (a) they are advisors and (b) those in which they are decision-makers.
- 5) Impact of external forces
 - e.g. constraints imposed by the community or by head office
 - constraints imposed by role in society (relations with other professions and with other elements of society)
 - influence of the physical environment.

- 6) Motivations for going into Public Health
- 7) Evaluation of their occupation vs. other occupations
 - that relate to environmental quality
 - that they might have gone into but did not because of lack of opportunity, etc.
- 8) Their views as to public tolerance of various types and levels of pollution.

4. The MHO or PHI resolves conflicts between his professional code of ethics and external forces by either:

- (a) delaying action until the political winds seem to be blowing in the right direction;
- (b) trying to educate the opposition;
- (c) laying their jobs on the line.

Information required on:

- 1) Is there a professional code of ethics?
 - for MHO
 - for PHI
 - OR for the professions from which they came (e.g. the Engineers' Joint Council, Canadian Medical Profession, etc.)
- 2) What the MHO or PHI would do when he suspected that a water body were polluted but felt that there would be adverse reaction to the imposition of regulations to deal with it.
- 3) Under what circumstances would they resign from their jobs:
 - do you like your job, if so why?
 - what other kinds of work would you like to do?
 - under what circumstances would you resign from your present job?
- 4) Factors in the community which they believe encourage (or discourage) various kinds of action

e.g.

 - who would support regulations and who would oppose them?
 - how would the pressure be felt?
 - what are the merits of charging for the use of water or the use of the atmosphere?
 - who would support this vs. those who would not?
- 5) To what extent have they need to organize publicity campaigns, pressure groups, public hearings, which mass media do they use?

- 6) Have they ever felt like resigning?
- 7) Views on practical issues
 - e.g. - fluoridation
 - septic tanks
 - swimming in lakes that receive domestic sewage or industrial wastes.
- 8) Views about his own agency vs. others
 - e.g. - should pollution problems be handled by Department of Health or Pollution Control Board?
 - how can various views and functions be co-ordinated and/or resolved?

5. The MHO perceives his role as that of the community doctor, and believes that he is equipped to perform this role because of his training, experience, and the image of his position in the public mind.

Information required on:

- 1) Professional training (including extent of administration training)
- 2) Types of experience
 - medical or engineer
 - negotiator
 - external relations (member of various clubs or organizations).
- 3) The ways in which they believe the public perceives the MHO or PHI
 - as one who knows more about the problems than anyone else
 - as a representative of a responsible government agency
 - as persons of unquestioned integrity, etc.
- 4) Their views as to the incompetence of the individual compared with the competence of the professional
 - views about problems facing society and the role which the individual can play
 - views about who should initiate action to deal with problems.
- 5) Their views as to whether man is a prisoner of Nature or vice versa.

- 6) Their views on problems faced by society and the relative urgency for solving them.
- 7) Their views about the powers of technology, science, and medicine.
- 8) Their views as to who constitutes their clientele.
- 9) Their views as to whether they are MHO's or biologists, engineers, medical men, etc.
- 10) Amount of time spent on various tasks in his job.
- 11) Views as to when he should be consulted.

1. MHO refers to the Medical Health Officer.

2. PHI refers to the Senior Public Health Inspector.

3. "Water Management" refers particularly to water quality management throughout.

5. There seems to be a growing concern with the quality of the environment in North America. Do you feel that there is a danger of the environment deteriorating in quality in B.C.?

1. Yes _____

2. No _____

If Yes, in what ways?

1. _____

2. _____

3. _____

4. _____

6. Which groups of people are the most concerned about environmental quality problems in your community?

1. Fish and Game Club 1. _____

2. Civic Officials 2. _____

3. Anti-pollution Committee 3. _____

4. Health Officials 4. _____

5. Lakeshore Property Owners 5. _____

6. Recreation Organizations 6. _____

7. Service Clubs 7. _____

8. Other _____ 8. _____

7. How do you judge the extent of water pollution in your area?

8. Is there conclusive evidence about the harmful health effects of water pollution?

Comments:

1. Yes _____

2. No _____

9. In your opinion, are the present criteria for assessing water pollution adequate?

1. Yes _____

2. No _____

If no, what other criteria might be used?

1. _____

2. _____

3. _____

4. _____

10. (a) Would you list the types of water quality problems that have confronted you over the past 3-4 years:

- | | |
|---------------------------|-----------|
| 1. Sewage | 1. _____ |
| 2. Potable drinking water | 2. _____ |
| (a) Chlorination | (a) _____ |
| (b) Fluoridation | (b) _____ |
| 3. Storm drainage | 3. _____ |
| 4. Wells | 4. _____ |
| 5. Recreation | 5. _____ |
| 6. _____ | 6. _____ |
| 7. _____ | 7. _____ |
| 8. _____ | 8. _____ |

(b) What is the general course of action you take to deal with water quality problems?

(c) Would you list the types of groups and individuals with whom you consult before making a decision - within and without the Department:

Within:

Without:

(d) Which types of individuals or groups often oppose or in some way limit your course of action?

- what are their general basic objections and how are they resolved?

(e) Generally, are you satisfied with the courses of action taken to deal with water quality problems?

- 1. Yes
- 2. No

1. _____
2. _____

Comments:

(f) Do you generally act as an advisor or as a decision-maker when involved with water quality problems?

- 1. Advisor
- 2. Decision-maker
- 3. Both

1. _____
2. _____
3. _____

Comments:

12. How do you become aware of these problems in your area?

- | | |
|---------------------------------|----------|
| 1. Complaints | 1. _____ |
| 2. Unsolicited letters | 2. _____ |
| 3. Casual conversation | 3. _____ |
| 4. Personal observations | 4. _____ |
| 5. Surveys | 5. _____ |
| 6. Public Meetings | 6. _____ |
| 7. Open line radio programs | 7. _____ |
| 8. Editorials and news releases | 8. _____ |
| 9. Other _____ | 9. _____ |
| | _____ |

13. Are there any acute non-water pollution problems in your area?

1. Yes _____
2. No _____

If yes, specify

1. _____
2. _____
3. _____
4. _____
5. _____

14. It has sometimes been claimed that technology ultimately has the answer to almost any problem. What do you think?

1. Yes _____
2. No _____

Comments:

15. Do you think we should proceed with the proposal to develop a Continental Water System (NAWAPA)?

1. Yes _____
2. No _____

Comments:

16. Have you heard of attempts to modify the weather?
 1. Yes _____
 2. No _____
17. Do you think it can be done?
 1. Yes _____
 2. No _____
18. How far ahead should we go in trying to modify the weather?
19. What do you think of the Super Sonic Transport Plane (SST)?
 1. Favourable _____
 2. Unfavourable _____
 3. Good and Bad _____
 4. Don't know _____
20. If man did find a way to control nature, who do you feel should decide in what ways it should be controlled?
21. Many professions have a code of ethics that is set out by their national body. Does your profession have such a code?
 1. Yes _____
 2. No _____

What are some of its major elements?

1. _____
 2. _____
 3. _____
 4. _____

22. In your opinion, what is the general public's image of your job?

23. Is this a fair appraisal of your job?

1. Yes _____

2. No _____

if no, explain

24. Is a MHO better equipped than anyone else to make the kind of decisions he has to make, or can any college graduate perform an effective job?

1. Yes _____

2. No _____

Explanation:

25. How would you describe your/the MHO's role in Public Health?

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

26. Do you think training programs in Public Health should include courses in administration?

- 1. Yes _____
- 2. No _____

27. Have you taken any administration courses or workshops during your career?

- 1. Yes _____
- 2. No _____

If yes, would you tell me the nature of these courses?

- 1. _____
- 2. _____
- 3. _____
- 4. _____
- 5. _____

28. If the MHO/PHI has transferred from one health unit to another within B.C. ask: What were the main reasons for your deciding to move?

- 1. _____
- 2. _____
- 3. _____
- 4. _____
- 5. _____

29. Have you every felt like resigning from the position of MHO/PHI in Public Health?

- 1. Yes _____
- 2. No _____

30. What kinds of things, in your opinion, might encourage a MHO/PHI to resign?

- 1. _____
- 2. _____
- 3. _____
- 4. _____
- 5. _____

31. Do you have public health considerations peculiar to your specific area?

- 1. Yes _____
- 2. No _____

if yes, describe:

- 1. _____
- 2. _____
- 3. _____
- 4. _____
- 5. _____

UNIVERSITY OF VICTORIA
STUDY OF PROFESSIONALS IN WATER MANAGEMENT
IN B.C.

PART II

CONFIDENTIAL

1. What was the main reason for your deciding to enter the Public Health Field? If more than one major reason, please rank 1, 2, 3 ...

- | | | |
|---------------------------|----|-------|
| 1. chance | 1. | <hr/> |
| 2. personal contacts | 2. | <hr/> |
| 3. work content | 3. | <hr/> |
| 4. working conditions | 4. | <hr/> |
| 5. education and training | 5. | <hr/> |
| 6. "calling" | 6. | <hr/> |
| 7. "stepping stone" | 7. | <hr/> |
| 8. political appointment | 8. | <hr/> |

2. Please indicate the number of years you have worked in fields outside Public Health.

- | | | | |
|-----------------------------|----|-------|-------|
| 1. business & industry | 1. | <hr/> | years |
| 2. government agency | 2. | <hr/> | |
| 3. schools | 3. | <hr/> | |
| 4. universities or colleges | 4. | <hr/> | |
| 5. welfare, social agencies | 5. | <hr/> | |
| 6. private practice | 6. | <hr/> | |
| 7. hospitals, institutions | 7. | <hr/> | |
| 8. other (specify) | 8. | <hr/> | |

3. What posts (where and for how long) have you been appointed to since entering Public Health?

	Position Held	Location	Period	
			From	To
			Mo/Yr.	Mo/Yr
1.	<hr/>	<hr/>	<hr/>	<hr/>
2.	<hr/>	<hr/>	<hr/>	<hr/>
3.	<hr/>	<hr/>	<hr/>	<hr/>
4.	<hr/>	<hr/>	<hr/>	<hr/>
5.	<hr/>	<hr/>	<hr/>	<hr/>

4. Medical Health Officers only (not Inspectors) please answer this question (4). Rank from (1-9) fields of medicine according to your interest in working in them:

- | | |
|----------------------------|----------|
| 1. dermatology | 1. _____ |
| 2. epidemiology | 2. _____ |
| 3. general practice | 3. _____ |
| 4. internal medicine | 4. _____ |
| 5. obstetrics - gynecology | 5. _____ |
| 6. pathology | 6. _____ |
| 7. psychiatry | 7. _____ |
| 8. public health | 8. _____ |
| 9. surgery | 9. _____ |

5. Which Universities or Training Institutes did you attend?

1. _____
2. _____
3. _____

6. In what year did you graduate? (first degree or diploma)

7. What age were you when you graduated?

8. What was your field of graduation? (enter degree or diploma)

<u>Field</u>	<u>1st degree or diploma</u>	<u>2nd</u>	<u>3rd</u>
1. medicine (specify specialty if any)	_____	_____	_____
2. public health (inspection)	_____	_____	_____
3. public health (general)	_____	_____	_____
4. civil engineering	_____	_____	_____
5. biology	_____	_____	_____
6. other (specify)	_____	_____	_____

9. What field were you planning to enter upon graduation?

- | | |
|-----------------------------|----------|
| 1. business, industry | 1. _____ |
| 2. government agency | 2. _____ |
| 3. schools | 3. _____ |
| 4. university or college | 4. _____ |
| 5. welfare, social agencies | 5. _____ |
| 6. private practice | 6. _____ |
| 7. public health | 7. _____ |
| 8. hospitals, institutions | 8. _____ |
| 9. other (specify) _____ | 9. _____ |

10. What organizations do you belong to?

Professional	Non-Professional
1. _____	1. _____
2. _____	2. _____
3. _____	3. _____
4. _____	4. _____
5. _____	5. _____

11. What publications do you read on a regular basis?

Professional Journals	Non-Professional Journals
1. _____	1. _____
2. _____	2. _____
3. _____	3. _____
4. _____	4. _____
5. _____	5. _____

12. Leisure time activities: Indicate in order of preference the 5 main activities you engage in. (1, 2, 3...)

1. visiting with friends, partying, dancing	1. _____
2. reading, watching TV, listening to music	2. _____
3. going to plays, concerts, lectures, museum	3. _____
4. driving for pleasure	4. _____
5. participating in clubs and other community organizations	5. _____
6. gardening and working in the yard	6. _____
7. photography	7. _____
8. workshop or homemaking hobbies	8. _____
9. sports (i.e. golf, curling, hockey, soccer, etc.)	9. _____
10. outdoor swimming or going to the beach	10. _____
11. boating, canoeing or water skiing	11. _____
12. fishing or hunting	12. _____
13. camping or picnicking	13. _____
14. snow skiing or other winter sports	14. _____
15. hiking or nature walks	15. _____
16. other (specify)	16. _____

13. Do you participate in outdoor recreation?

1. Yes _____

2. No _____

If so, where and approximately how often do you do so in a given year?

13. Location* How often** (use guide below)
1. _____
2. _____
3. _____
4. _____
5. _____

* Please indicate name of recreation area, park, beach, etc.

- ** (1) 1-5 times
 (2) 6-10 "
 (3) 11-15 "
 (4) 16-20 "
 (5) over 20

14. To what extent have you travelled in Canada, the U.S.A. or abroad?

- (a) Please indicate (✓) in column I those areas which you have visited.
- (b) In column II please note the number of times you have visited those areas over the past 4 years.

<u>Area</u>	I	II
1. one or more provinces in Western Canada other than B.C.	1. _____	_____ times
2. one or more states in Western U.S.A.	2. _____	_____
3. Eastern Canada	3. _____	_____
4. Eastern U.S.A.	4. _____	_____
5. Outside North America	5. _____	_____

15. How many business trips related to environmental health did you take during the past year (1968-1969 fiscal year) outside of your health unit boundaries?

Where	No. of Visits	Purpose*
1. _____	_____	_____
2. _____	_____	_____
3. _____	_____	_____
4. _____	_____	_____
5. _____	_____	_____
6. _____	_____	_____
7. _____	_____	_____
8. _____	_____	_____

*'Purpose' includes such matters as consulting advice of neighbouring officers, visits with officials at Head Office, Conferences, etc.

16. Various kinds of water quality problems in B.C. come before the Department of Health and the Pollution Control Board. These include the disposal of domestic sewage, the disposal of industrial effluents, the dumping of garbage into water bodies, etc.

(a) In your opinion, which water quality problems should be designated as the responsibility of either the D. of H. or the PCB:

Department of Health	Pollution Control Board
1. _____	1. _____
2. _____	2. _____
3. _____	3. _____
4. _____	4. _____

(b) In your opinion, is the present legislation adequate to handle the various water quality problems? ()

1. Yes _____

2. No _____

(c) What improvements might be made to present legislation or to its administration in order to make water quality control more effective?

1. _____

2. _____

3. _____

17. What experience prior to entering the field of Public Health have you found particularly valuable for your present work? ()

1. general learning	1. _____
2. knowledge of community	2. _____
3. administration	3. _____
4. philosophy	4. _____
5. specific technical procedures	5. _____
6. person-to-person relations	6. _____
7. other (specify)	7. _____

18. (a) Do you make use of any of the forms of mass communication, such as ideal papers, radio and T.V., in your work?

1. Yes _____

2. No _____

(b) If "No", please explain why not:

18. (c) If "yes", for what purposes do you use them and approximately how often during the course of a year? (use the scale provided below)

	Media	No. of times/year*	Purpose
1.	_____	_____	_____
2.	_____	_____	_____
3.	_____	_____	_____
4.	_____	_____	_____

- * (1) 1-5 times
- (2) 6-10 "
- (3) 11-15 "
- (4) 16-20 "
- (5) over 20

19. Have you ever attempted to organize groups to increase public understanding of environmental quality problems in your community?

- 1. Yes _____
- 2. No _____

If "Yes", describe briefly:

20. The Medical Health Officer has been described as a man playing 5 possible roles:

- | | |
|--|----------|
| 1. physician | 1. _____ |
| 2. health administrator | 2. _____ |
| 3. civic official | 3. _____ |
| 4. leader or coordinator of community health affairs | 4. _____ |
| 5. health educator | 5. _____ |

From this list please rate (1-5) the description which best represent the roles of the MHO in your Unit.

21. What do you like most about your present job? Please rank 1, 2, 3...

- | | |
|---|----------|
| 1. salary | 1. _____ |
| 2. working conditions | 2. _____ |
| 3. interesting subject matter | 3. _____ |
| 4. co-workers from whom one can learn | 4. _____ |
| 5. making important decisions | 5. _____ |
| 6. doing independent work | 6. _____ |
| 7. working in a desirable geographic area | 7. _____ |

21.

- | | | |
|---|-----|-------|
| 8. co-workers who have great influence | 8. | _____ |
| 9. having maximum job security | 9. | _____ |
| 10. working with general public | 10. | _____ |
| 11. seeing the implementation of your decisions | 11. | _____ |

22. Are there any frustrations attached to your job? (✓)

- | | |
|--------|-------|
| 1. Yes | _____ |
| 2. No | _____ |

If "Yes", briefly describe:

1. _____
2. _____
3. _____
4. _____
5. _____

23. What profession(s), other than medicine, might you consider entering if you had the opportunity?

1. _____
2. _____
3. _____

24. In what town, or area, did you spend most of your life up until you were 15 years of age?

1. _____
2. _____

25. Where did you live 5 years ago? _____

26. What was your father's occupation? (✓)

- | | | |
|---|-----|-------|
| 1. professional (medical) | 1. | _____ |
| 2. professional and technical (other than medical) | 2. | _____ |
| 3. managerial | 3. | _____ |
| 4. clerical | 4. | _____ |
| 5. salesman | 5. | _____ |
| 6. service and recreation | 6. | _____ |
| 7. transport and communication | 7. | _____ |
| 8. primary industry (fishing, logging, farming, etc.) | 8. | _____ |
| 9. labourer | 9. | _____ |
| 10. tradesman, production process and related works | 10. | _____ |
| 11. other (specify) _____ | 11. | _____ |

27. During the course of a year, approximately (%) how much time do you spend on:

- (a) activities which relate to water quality responsibilities? _____ %
- (b) recording and reporting your responsibilities on paper? _____ %

Assuming the needed funds, personnel, etc. could be provided what would you consider to be an ideal allotment of time for:

- (a) activities which relate to water quality responsibilities? _____ %
- (b) recording and reporting your responsibilities on paper _____ %

Comments:

28. What community groups (boards, councils, committees, etc.) are you actively involved with as a representative of Public Health?

- 1. _____
- 2. _____
- 3. _____
- 4. _____

29. How long did it take you to complete this questionnaire?

_____ minutes.

Please return the questionnaire in the attached envelope to:

Miss J. Elizabeth McMeiken
Department of Geography
University of Victoria
Victoria, B.C.

APPENDIX F

Exerpt from Powell River News, June 26, 1969, p. A-5.

POLLUTION FIGURES: WHAT THEY MEAN

In response to a request from The News Dr. D.L. Gemmill medical health director for Coast-Garibaldi prepared the following report on what pollution count figures mean.

Local health unit has made arrangements with the provincial health laboratories to receive a greater than usual number of water samples from the Powell River area. In particular, several samples will be forwarded to the laboratories on a regular basis from the bathing water at Willingdon Beach and Cranberry Lake. It is only by concentration and regular sampling that we can maintain an accurate surveillance of the beaches.

Every sample of water that is tested is different and counts will be affected by such factors as temperature changes, salinity, dilution, wind, rainfall and tides.

I have been asked to explain what some of the figures mean. In many cases, samples of water are reported as 0/5, 1/5, 2/5, 3/5, 4/5, and 5/5. When we get a 5/5 sample for example, it means that of the water sample submitted, a 50 millilitre portion was divided into 5 tubes of 10 millilitres each and tested for the presence or absence of coliform organisms. If coliform organisms are present in all 5 tubes then the report received is 5/5. Where this

test indicates the existence of pollution it does not indicate the extent. It does not differentiate between a highly polluted water and a slightly polluted water. Follow up samples do not indicate whether the water is getting worse or better using this method of counting.

MPN (most probable number) is used therefore as an index of the number of coliform bacteria which more probably than any other number are contained in a measured volume of water. This figure is arrived at mathematically, and it gives us a guideline for comparisons in appraising the sanitary quality of a water.

The standard most generally used has been adopted from the United States Public Health Service. In the U.S. the coliform counts for bathing waters have varied from state to state between 1000 and 3000 coliforms per 100 millilitres. We shall adopt the figure of 1000 for our study. On the basis of calculations the samples reported on so far from June 16 are 540 for Willingdon Beach and 17 for Cranberry. A count of 50 is generally used for fresh water.

This would indicate that the waters are acceptable for recreational purposes.

However, many more samples will be necessary, and this type of sampling will be continuous throughout the summer months. Should these waters consistently show deterioration then you will be informed.

I have reviewed the sanitary survey conducted in July and September of 1968 by the Municipality of Powell River and the Public Health Engineering Department. This was essentially a float survey which not only indicates the extent of pollution but the sources as well. The counts for Willingdon Beach during these months generally fell within the acceptable range for bathing waters. It was the type of survey that can be used as a preliminary step in future planning for better sewage disposal.

I can assure you that the public health department is looking into the many aspects of pollution.

I am pleased also to see that young people across Canada are becoming concerned both about air and water pollution. C. Palmer and the Brooks Anti-Pollution Association visited our Health Center on June 13 and we indicated to them that where possible we shall assist them in future studies in pollution and environmental control.

People mean pollution. It is one of the detrimental results of the affluent society in which we are living and we are going to have to correct past mistakes as well as prevent mistakes in the future. The eventual control of pollution will require the best in all of us: public health personnel, industry, government, and every private citizen.

TABLE 1

MULTIPLE REGRESSION ANALYSIS: PERCEPTION OF PROBLEMS

Independent Variable Entering the Equation	Sign	R	R ²	Increase in R ²	T-value		Level of Significance
					To Enter Equation	In Final Equation	
(1. Multiple Water Criteria)**							
22. M.H.O./P.H.I.	+	.162	.026	.026	1.015	1.015	*
(2. Pesticides, Noise, and Purification)							
25. Nature over Man	-	.243	.059	.059	1.544	1.311	.10
23. Rank and Mobility	+	.301	.091	.032	1.136	1.122	*
24. Years in Public Health	-	.325	.106	.014	0.781	0.781	*
(3. Environment Quality and Sewage Disposal)							
24. Years in Public Health	-	.423	.179	.179	2.874	2.907	.005
23. Rank and Mobility	+	.496	.246	.067	1.822	1.983	.05
22. M.H.O./P.H.I.	+	.562	.316	.070	1.910	1.698	.05
26. Man over Nature	+	.576	.332	.016	0.919	0.919	*
(4. Broad Perspective)							
23. Rank and Mobility	-	.514	.264	.264	3.695	3.631	.005
26. Man over Nature	+	.531	.282	.018	0.941	0.941	*

* statistically insignificant (i.e. below .10 level of significance).

** variables in brackets refer to the dependent variable in the regression equation.

TABLE 2

MULTIPLE REGRESSION ANALYSIS: PERCEPTION OF SOLUTIONS

Independent Variable Entering the Equation	Sign	R	R ²	Increase in R ²	T-value		Level of Significance
					To Enter Equation	In Final Equation	
(5. Improved Facilities)**							
26. Man over Nature	+	.237	.056	.056	1.506	1.446	.10
23. Rank and Mobility	-	.304	.092	.036	1.214	1.214	*
(6. Improved Administration and Standards)							
24. Years in Public Health	-	.309	.096	.096	1.996	2.013	.025
23. Rank and Mobility	-	.387	.150	.054	1.541	1.728	.05
25. Nature over Man	-	.432	.187	.037	1.276	1.245	*
26. Man over Nature	-	.446	.199	.012	0.730	0.730	*
(7. More Meaningful Water Quality Parameters ¹)							
22. M.H.O./P.H.I.	-	.189	.036	.036	1.188	1.293	.10
26. Man over Nature	+	.221	.049	.013	0.771	0.711	*
(8. Adequate Legislation)							
25. Nature over Man	-	.275	.076	.076	1.763	1.763	.05

* Statistically insignificant

** variables in brackets refer to the dependent variable in the regression equation.

TABLE 3

MULTIPLE REGRESSION ANALYSIS: ROLES OF VARIOUS GROUPS IN WATER QUALITY DECISION-MAKING
 ROLE OF PUBLIC

Independent Variable Entering the Equation	Sign	R	R ²	Increase in R ²	T-value To Enter Equation	In Final Equation	Level of Significance
(9. Dissatisfaction with Role of Public)**							
24. Years in Public Health	-	.414	.171	.171	2.807	2.739	.005
25. Nature over Man	-	.499	.249	.078	1.957	2.084	.025
23. Rank and Mobility	-	.523	.274	.025	1.094	1.094	*
(10. Satisfaction with Role of Public)							
26. Man over Nature	-	.241	.058	.058	1.533	1.520	.10
23. Rank and Mobility	-	.342	.117	.059	1.571	1.597	.10
24. Years in Public Health	+	.362	.131	.014	0.764	0.814	*
25. Nature over Man	-	.376	.141	.010	0.646	0.646	*
(11. Opposition from Vested Interests)							
26. Man over Nature	-	.230	.053	.053	1.459	1.476	.10
23. Rank and Mobility	+	.315	.099	.046	1.374	1.249	*
25. Nature over Man	-	.337	.114	.014	0.765	0.874	*
22. MH.O./P.H.I.	+	.356	.127	.013	0.730	0.730	*
(12. Organize Groups)							
26. Man over Nature	+	.135	.018	.018	0.835	0.838	*

* statistically insignificant

** variables in brackets refer to the dependent variable in the regression equation.

TABLE 4

MULTIPLE REGRESSION ANALYSIS: ROLES OF VARIOUS GROUPS IN WATER QUALITY DECISION-MAKING
 ROLE OF PUBLIC HEALTH

Independent Variable Entering the Equation	Sign	R	R ²	Increase in R ²	T-value		Level of Significance
					To Enter Equation	In Final Equation	
(13. Water Quality as a Health Problem ¹)							
25. Nature over Man	+	0.180	.032	.032	1.129	1.129	*
(14. Intra-Agency Consultation)							
22. M.H.O./P.H.I.	+	.724	.524	.524	6.476	6.338	.005
24. Years in Public Health	-	.744	.554	.029	1.554	1.710	.05
25. Nature over Man	+	.762	.580	.027	1.504	1.504	.10
(15. Extra-Agency Consultation)							
26. Man over Nature	-	.352	.124	.124	2.316	2.433	.02
24. Years in Public Health	-	.439	.193	.069	1.776	1.928	.05
25. Nature over Man	+	.491	.241	.048	1.510	1.621	.05
22. M.H.O./P.H.I.	-	.505	.255	.014	0.816	0.816	*
(16. Advisor and Decision-maker)							
22. M.H.O./P.H.I.	+	.212	.212	.212	1.336	1.508	.10
26. Man over Nature	-	.276	.076	.031	1.122	1.164	*
23. Rank and Mobility	-	.311	.097	.021	0.899	0.899	*
(17. M.H.O. Role as a Health Administrator)							
24. Years in Public Health	-	.415	.172	.172	2.810	2.749	.005
23. Rank and Mobility	-	.463	.214	.042	1.415	1.572	.10
25. Nature over Man	-	.502	.252	.038	1.337	1.443	.10
22. M.H.O./P.H.I.	+	.514	.264	.012	0.771	0.771	*

* statistically insignificant

** variables in brackets refer to the dependent variable in the regression equation.

TABLE 5

MULTIPLE REGRESSION ANALYSIS: ROLES OF VARIOUS GROUPS IN WATER QUALITY DECISION-MAKING

ROLE OF GOVERNMENT

Independent Variable Entering the Equation	Sign	R	R ²	Increase in R ²	T-value		Level of Significance
					To Enter Equation	In Final Equation	
(18. Water Quality as a Health Problem ²)**							
25. Nature over Man	+	.209	.044	.044	1.320	1.141	*
22. M.H.O./P.H.I.	+	.252	.064	.020	0.884	0.884	*
(19. More Meaningful Water Quality Parameters ²)							
26. Man over Nature	-	.246	.061	.061	1.565	1.560	.10
22. M.H.O./P.H.I.	+	.283	.080	.020	0.885	0.878	*
23. Rank and Mobility	+	.313	.098	.018	0.853	0.863	*
24. Years in Public Health	+	.330	.109	.011	0.646	0.646	*
(20. Provincial vs. Municipal Consultations)							
23. Rank and Mobility	-	.128	.016	.016	0.797	0.797	*
(21. Consultations with Other Provincial or Federal Agencies)							
22. M.H.O./P.H.I.	+	.131	.017	.017	0.813	0.933	*
25. Nature over Man	-	.182	.033	.016	0.783	0.783	*

* statistically insignificant

** variables in brackets refer to the dependent variable in the regression equation

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INTERCORRELATIONS AMONG COMPOSITE STUDY VARIABLES
SHOWING DIRECTION AND STATISTICAL SIGNIFICANCE
OF RELATIONSHIPS

Level of Statistical Significance

Direction of Correlation
Positive Negative
+: +.20 to + .60 -: -.20 to - .60
#: +.60 to + 1.00 =: -.60 to -1.00

The table is a lower triangular matrix where each row and column represents a composite study variable. The variables are listed on the left side of the page and along the top diagonal. The matrix is filled with small symbols indicating the direction and statistical significance of the intercorrelations between every pair of variables. The symbols used are: '+' for positive correlations between +.20 and +.60, '-' for negative correlations between -.20 and -.60, '#' for positive correlations between +.60 and 1.00, and '=' for negative correlations between -.60 and -1.00. The diagonal elements are all '+' signs, representing a correlation of 1.00 for each variable with itself.