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Management Improvement Strategies

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The Great Lakes of the United States and Canada

A Reader on Management Improvement Strategies

Leonard B. Dworsky
and
Charles F. Swezey,
Editors

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THE GREAT LAKES OF THE UNITED STATES AND CANADA

A Reader On
Management Improvement Strategies

Editors

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Charles F. Swezey - Executive Officer--Canada-United States Inter-University Seminar, Cornell University*

The Reader is based on the report of the Canada-United States Inter-University Seminar, "A Proposal for Improving the Management of the Great Lakes of the United States and Canada."

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Dale Reynolds	An Information System for the Management of Lake Ontario
Arvid L. Thomsen	Participation in Water and Land Management
Lawrence W. Saunders	Toward a National Population Redistribution Policy: Some Policy Issues
Donald R. Kisicki	Environmental Management of the Great Lakes International Boundary Areas: A Case Study of the Niagara Urban Region
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As Part of A
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Established By The
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Preface

In March and May, 1973 the subcommittee on Inter-American Affairs of the House of Representatives Foreign Affairs Committee held hearings on the Great Lakes Floods of 1973. It was clear from the testimony of the public and many members of Congress that flooding caused by high lake levels was not the only matter of concern. Much interest was expressed about the way decisions are made to manage the Great Lakes over a wide array of problems. The role of the International Joint Commission, established by the Boundary Water Treaty of 1909 between the United States and Canada, was also examined.

An important contribution to these hearings was the report of the Canada-United States Inter-University Seminar on the Management of the Great Lakes and other reports published by the Cornell University Water Resources and Marine Sciences Center in collaboration with the Office of Water Resources Research, U.S. Department of the Interior and the New York Sea Grant Program.

This Reader, based upon the Sub-committee hearings and the Seminar and other reports, is an important reference for members of Congress, and should be useful to Federal, State and local officials in the Great Lakes Region and to others concerned about the future of the Great Lakes. We are in need of a stronger public dialogue about how the Great Lakes are to be managed to meet current and emerging problems, and this Reader will contribute importantly toward effective discussion.

Dante Fascell

Dante B. Fascell
Member of Congress and Chairman
Sub-committee on Inter-American Affairs
Committee on Foreign Affairs
U.S. House of Representatives

Foreword

Canada and the United States meet at a boundary line that stretches across the continent from the Atlantic Ocean to the Pacific Ocean for a distance of 3500 miles. In terms of population and industrial activity, the most important segment of that long international boundary is the Great Lakes section which extends from the northwestern shore of Lake Superior to Cornwall, New York, a span of some 1400 miles. The Great Lakes and their connecting waterways form the largest group of lakes in the world. It is in the Great Lakes Basin that the huge urban and industrial complex of the north central United States adjoins the most populous and most productive region of Canada. Although the Basin is bisected by a political boundary line, the geographical relationship of these Canadian and U.S. urban/industrial centers, results in a substantial regional interaction, irrespective of national boundaries. The Canadian and U.S. citizens living and working in the Great Lakes region share in the benefits derived from a highly productive economy sustained by the most important system of inland water transportation in the world.

While significant economic progress has been achieved in the Great Lakes region, such progress has not been without social and environmental costs. It has been amply demonstrated in recent years that the other side of the development coin is environmental degradation, natural resource depletion and land use mismanagement. One well-publicized manifestation of this phenomenon is the serious deterioration of water quality in the Great Lakes. Municipal and industrial pollution of the waters of the Great Lakes has been a long-standing problem with government concern dating back to 1912. Government awareness and interest notwithstanding,

the plain fact of the matter is that the water quality problem persists and grows. It would be unfair to assert that nothing has been done, but it would be negligence of a high order to suggest that what has been done has been adequate.

Water quality is not the only resource management problem facing the people of the Great Lakes region. Other facets of the resource management picture include: lake levels, industrial and municipal water supply, navigation, water-based recreation, shoreline protection and development, hydropower and fish and wildlife protection. There are other concerns, but these, along with degradation of water quality, are the main ones. It is important to take note of the fact that these various facets of the total problem are all interrelated. Lake levels affect navigation, hydropower capacity and shoreline use; industrial and municipal dumping of wastes interferes with the supply of water for industrial and municipal purposes, not to mention recreational use and shoreline development; navigational facilities compete with other uses including water-based recreation and alternative shoreline development; and fish and wildlife are threatened by pollution and by uncontrolled use of wetlands and shorelines. This is the barest suggestion of the problem; the actual interrelationships are far more complex.

In national terms the need for governmental action and involvement in resource planning and management has been recognized by some for many years. The heart of the problem for both countries seems to have been until recent years a definite reluctance on the part of both governments to organize more effectively for water and land resources management. The situation appears a little brighter in Canada as the result of recent cabinet reorganization at the federal level and similar actions by the Ontario Government.

For the United States, too, the situation seems to be improving. A succession of administrations since the days of Theodore Roosevelt has sought to bring a semblance of order to the exploitation of the country's resources by, among other things, establishing a separate Federal department for natural resources or a similar national-level coordinative mechanism. While major institutional changes have not met with agreement in the U.S., significant improvements are reflected in the establishment since 1965 of such instrumentalities as the Federal Water Resources Council, the Great Lakes Basin Commission, and the Environmental Protection Agency. On the international level, the creation in 1972 of the joint Great Lakes Water Quality Board was a definite step forward.

Progress, however, has not kept pace with resources management needs. The story is a complicated one, and it has often been defined in terms of the advantage enjoyed by influential special interests, public and private, over the diffused public interest. More fundamental, perhaps, has been the lack of effective action to impress on legislative bodies and executive agencies the urgency of creating improved instruments to strengthen the management of our natural resources. Unusable water and air and insufficient or costly fuel for home and car have a way of sensitizing even the most unconcerned citizen and, in recent years, a refreshing surge of awareness on the part of government and the public has occurred.

The objective of this book is to stimulate public interest and debate on ways in which the management of the Great Lakes of the United States and Canada can be improved to attack current problems and be better prepared to meet those of the future. The central concern here is on the institutional factors that affect the management of the land, air, and water resources of the Great Lakes region. The existing resources

management problems are described and a number of recommendations on alternative management strategies is presented.

This volume is a synthesis of work done at Cornell University and in collaboration with other Great Lakes Basin universities in the United States and Canada during the years 1971-1973. This study was carried out in a coordinated manner. The first was a faculty group representing some twenty universities in Canada and the United States which examined the problems and alternatives of managing the resources of the Great Lakes. The work of this group was supported by the Office of Water Resources Research of the U.S. Department of the Interior. The considerations and recommendations of this joint faculty group are the subject of Part I of this volume that we have chosen to call A Reader on Management Improvement Strategies. The second concerted effort to focus on Great Lakes problems was carried out through directed graduate research at Cornell University under the guidance of faculty members who were at the same time actively involved in the joint Canada-United States faculty group (Dworsky, Gates and Allee). The graduate student effort concentrated on some selected major management issues of the Great Lakes Basin. This work, which was supported by the Office of Water Resources Research and the Corps of Engineers, has been edited and revised by the authors to form the ten chapters of Parts II and III of this Reader.

The reason this compendium was assembled was to provide specific information in order to focus the attention of concerned persons on some of the more important issues relating to the management of the Great Lakes. The Reader should serve as a useful guide to discussion by graduate and undergraduate student groups and their instructors; by national and local

citizens groups; conservation organizations; environmental organizations; civic groups; and other public and private organizations; and by legislative and executive agencies in local, state/provincial and national governments.

The information in this book deals with the problems and opportunities associated with resource management in the Great Lakes region. Whereas the governmental machinery of both countries is now being reorganized in an effort to meet, in more adequate way, today's challenges in the field of resource management, the Great Lakes region, because of its binational character, represents a somewhat more intractable problem. Without waiting for federal reorganization, advances are now being made by various existing organizations toward the improvement of resource management in the Great Lakes Basin. However, there is the need now to consider the opportunities associated with the establishment of some form of integrated management of these efforts. In particular, there is need to examine the nature of the arrangements for a joint Canada-United States body that could carry out a range of responsibilities with regard to certain lake management problems of concern to both countries.

PART ONE

IMPROVING THE MANAGEMENT OF THE GREAT LAKES

INTRODUCTION - PART I

The thesis developed in Part I is that the heart of the problem of managing the land, air, and water resources of the Great Lakes region lies in institutional (organizational) inadequacies on both sides of the international border and that a strengthening of present institutional arrangements is a matter of considerable urgency. It provides a detailed summary of a study carried out in 1971-1972 by a group of university faculty members from some twenty U.S. and Canadian educational institutions located within the Great Lakes Basin. The report of this study was published in 1973.[1] This effort by the Canada - United States University Seminar focused on the institutional problems of resource management in the Great Lakes Basin and recommended, among other things, a substantially strengthened International Joint Commission[2] or, as the alternative, a new treaty organization vested with broad authority. Thus, Part I provides an overview of the problem as well as some possible solutions. It also provides the necessary backdrop for the succeeding Parts II and III which examine in detail some of the major considerations that the designers of a revised or new joint body would be obliged to address, namely: general structure and scope of authority; the development of an effective in-house information collection and interpretation capability; provision for public participation in the decisions affecting resource-use; and, finally, the special problems associated with water quality, fish and wildlife, unplanned urban development and international frontiers.

During the period of December 1971 to June 1972, faculty members from about twenty universities and colleges in Canada and in the United States met to explore ways in which the institutional structure for the management of the water and land resources in the Great Lakes Basin might be strengthened to the mutual advantage of both countries. Approximately thirty faculty members were invited to participate, with nearly equal representation from each country. In addition, some thirty government representatives were also invited to attend the Seminar meetings. The Seminar participants carried out their tasks in three general meetings and in working sessions of a planning group between the regular sessions. The first full meeting was held in December 1971, at York University, Toronto, Ontario; the second in March 1972, at Cornell University, Ithaca, New York; and the third again at York University in June 1972. The work of the planning group continued throughout 1972 to bring the Seminar report to completion.

The undertaking of this Canada-United States University Seminar in a sense reaffirmed the growing cooperation between Canada and the United States on Great Lakes problems. Participants recognized the progress and positive contributions being made in biophysical research on the lakes, as exemplified by the International Field Year on the Great Lakes (IFYGL) which became operational in the spring of 1972, and by the studies carried out under the aegis of the International Joint Commission on Great Lakes water pollution.

The rationale behind the selection of the inter-university approach was based on the present direction of research on the Great Lakes. Current research on the Great Lakes Basin is heavily oriented toward investigations of physical and biological phenomena with a conspicuous gap in research in the fields of natural resource management, institutional (organizational) arrangements and public policy with respect to the Great Lakes. One reason for this imbalance is that the lakes are shared by two countries, a fact that inhibits joint, comprehensive investigations of the social, economic, and political environments of the Great Lakes Basin. Governmental and regional agencies of each country are understandably reluctant to undertake investigations of matters directly involving the interests of the other country. The International Joint Commission (IJC) is the only currently available mechanism providing a framework for such joint research ventures; however, the IJC has been infrequently utilized for those purposes. In view of these realities, there seemed to be a role for the universities in filling this research hiatus. There was a firm belief on the part of the organizers and the participants of the Seminar that an open, binational forum concerned with the problems of Great Lakes management was needed as a contribution to better public understanding of the current situation and to provide some guidance to future developments.

The Canada-United States University Seminar took up the question of improving the two countries' capabilities for managing the water and related land resources of the Great Lakes. A principal objective of the faculty group was to produce a report which would promote discussion in both countries on the problems of the Great Lakes. Another purpose was to set forth in general terms the available alternatives for improving the management of the water and related land resources of the Great Lakes Basin.

The Seminar participants were also cognizant of the negotiations then taking place between the two countries to strengthen the hand of the International Joint Commission in controlling transboundary water pollution. Those negotiations resulted in the 1972 Agreement on Great

Lakes Water Quality which established for the first time common and specific water quality objectives for the Great Lakes and provided for joint programs to achieve the objectives.

While acknowledging these real accomplishments, the Seminar at the same time felt it was necessary to ask what else had to be done. The rates of population growth, urbanization and industrialization in the Great Lakes Basin, especially in the lower lakes, are leading to even more intensive use of the water and associated land resources, and the generation of even more problems and conflicts of interest among resource uses and users. Above all, they reveal the desirability of exploring how some of these problems might be anticipated and acted upon before they reach crisis proportions. The scope of attention would then have to go beyond cooperation on controlling transboundary water pollution and joint efforts on water research. But how far, and in what way? These were the central questions posed to the Seminar.

The methodology used by the Seminar included the following tasks (1) identification of the resource management problems of the Great Lakes Basin; (2) examination of existing organizational forms; (3) review of previous research efforts on institutional arrangements; (4) analysis of the International Joint Commission; (5) review of the current limits of joint authority with respect to the management of the international Great Lakes; (6) development of the general features of a new joint institutional arrangement and finally; (7) development in general terms of the available alternatives for improving the management of the water and related land resources of the Great Lakes Basin.

The three plenary meetings of the Seminar each followed approximately the same pattern. Working groups were formed and met simultaneously to consider the original working papers and two subsequent reformulations of those papers. The varying views of the working groups were considered in these full sessions and in post-conference meetings of the Planning Secretariat. The objective was to produce a report which would offer a carefully considered set of policy options on the joint management of the water and related land resources of the Great Lakes Basin.

Resource Management: Definitions

The term "resource management" or some variation thereof are frequently used. Some definitions seem to be in order at this point.

First, "resource management" means "natural resource management." Second, a distinction is made between the terms "resource management" and "environmental management." Resource management is the larger concept. It encompasses public and private sector decisions and actions directed toward the fairest and most efficient allocation of all our natural resources (water, land, air, mineral and energy resources). Environmental management is an important and integral part of resource management; however, it is viewed more as an organized activity designed to protect and preserve. This function is concerned with such things as preserving ecological systems, preventing abuse and depletion of natural resources and protecting and enhancing the air, water and land environments for health and esthetic reasons. Another way of stating the difference in resource management is analogous to the proposed U.S. Department of Energy and Natural Resources, whereas the analog of environmental management is the U.S. federal Environmental Protection Agency.

Another term used is "water resource management." The term encompasses public and private sector decisions and actions directed toward the fairest and most efficient allocation of the water resources of the Great Lakes region, irrespective of national boundaries. In this region water resource considerations obviously predominate. The Canada-United States University Seminar identified 15 different concerns or problems in the overall resource management picture of the Great Lakes region. Out of that number, 11 are directly related to water resource management. They are: water quality, municipal and industrial water supply, agricultural water supply, lake level control, hydropower, flood control, navigation, shoreline protection and development, fish and wildlife protection, water-based recreation and solid waste disposal (shoreline dumping). Adding the remaining four resource management problems (air quality, urban and industrial land use, agricultural land use and land transportation) completes the set of resource management problems of the Great Lakes region initially considered by the seminar.

The first four chapters, which comprise Part I, consider the institutional problems in the Great Lakes region, assess the International Joint Commission and its work, identify some viable resource management alternatives, and describe public actions that have taken place partly or wholly attributable to the activities of the Seminar and its report.

CHAPTER I

THE INSTITUTIONAL PROBLEM

Despite the great difference in population, Canada and the United States are strinkingly similar and are beset by many of the same problems. With only one-tenth the U.S. population, Canada encompasses a total land and freshwater area larger than the United States. The important fact, however, is that this smaller population is quite concentrated. Over 60 percent of Canada's population and 80 percent of the industrial production are found on the southern Ontario peninsula and along the St. Lawrence River. Thus, the Canadian portion of the Great Lakes region includes the wealthiest and most populous part of the country. The urban conurbations and industrial centers in this part of Canada are all but indistinguishable from their U.S. counterparts ringing the southern shores of the Great Lakes. This means that the kinds of problems confronting state, municipal and local governments on the U.S. side are in most cases identical to those facing provincial, municipal and local governments in Canada. For both countries, the Great Lakes region is a dynamic one undergoing rapid population growth and industrial expansion. As population increases, industry and agriculture expand and resource consumption increases; and the residuals of production and consumption place ever greater stresses on the environment. The effects of these stresses are beginning to appear in the Great Lakes region with increasing frequency.

Institutional Inadequacies

In North America the related problems of resource allocation and environmental quality are now taking their rightful place in the arena of public issues. Citizens are now applying pressures on their governments as a means of defending certain values that had lesser priority in

earlier years. While recognizing that a beginning has been made, the facts of the matter are that we are not managing well our natural resources and, in the face of increasing pressures, progress will continue slowly and haltingly, unless the requisite political will for some fundamental changes emerges.

There are a number of common factors that account for our inability to respond more effectively to the challenges of managing not only our water and land resources, but other social problems as well. A listing of a few of the more significant factors hindering resource management would include: the diffused public interest; differing views about national priorities; inadequate legislation and enforcement; special interest politics; fragmentation of responsibilities within and among governments; organizational jealousies; and lack of understanding of man-environment relationships. These elements operate individually and jointly in ways that seriously impede public programs that are designed to yield effective management of our resources.

There is, however, a specific and fundamental contributive factor and that is our failure to establish an institutional structure adequate to meet current and future challenges. In the Great Lakes study by the Canada-United States University Seminar this was identified as the underlying basic deficiency.

The institutional problem is defined as that of determining what kinds of government organizations are needed and how these organizations should be related to each other in order to achieve the most effective management of the natural resources of the Great Lakes region at the lowest possible economic, political and social costs.

There is, of course, an existing institutional apparatus for managing the Great Lakes involving all levels of government in both Canada and the United States. This present structure, however, is not the product of any carefully devised United States - Canadian long-term plan for the Great Lakes region. On the contrary, the present mix of governmental departments, agencies, boards and commissions evolved over the years at a rate, and to an extent, that was determined by the ever-changing limits of political feasibility in each country. In its present state, we consider the present mix of institutions inadequate and in need of fundamental revision.

Doubtless many of the other obstacles to improved management of the region could be reduced with a widespread consensus in both countries to spend the money and to make the other sacrifices that the improved management of our natural resources will require. The advent of such a consensus, however, will not lead automatically to a solution of the institutional problem which, in our view at least, is the sine qua non to achieving improved resource management in the Great Lakes Basin. Such general agreement must also provide for the establishment of an effective government organization that can assist society in reaching its objectives with respect to water and land resources. Unless the institutional problem is successfully confronted, a consensus to act decisively could result in the wasteful expenditure of large sums of public monies and resources and a net social gain far below that which could have been expected from a better designed governmental structure.

In summary, the rigidities of present institutional arrangements are blocking progress toward the efficient use of our resources. Canada and the United States must act now, individually and jointly, to remove

these obstacles if the resources of the Great Lakes region are to be preserved and enhanced for this and future generations.

The difficulties of organizing governments to cope with resource management problems on a national or regional scale are, of course, encountered elsewhere than in North America. The matter is especially acute in the industrialized countries. It is an international problem in at least two important ways. First, while every country is faced with its own unique set of resource management or environmental problems, no country has developed as yet an effective institutional apparatus for dealing with them. Second, certain resource/environmental problems are transnational and even intercontinental in scope, in that certain acts or the failure to act on the part of one country may affect adversely the citizens of one or more other countries.

The United Nations attempted to deal with these concerns when it convened the United Nations Conference on the Human Environment in June 1972 in Stockholm, Sweden. It is of interest to note how far the Conference was prepared to go regarding transnational or international water quality issues. Recommendation 51 of the Conference is quoted as follows:

> "It is recommended that Governments concerned consider the creation of river-basin commissions or other appropriate machinery for co-operation between interested States for water resources common to more than one jurisdiction.
>
> (a) In accordance with the Charter of the United Nations and the principles of international law full consideration must be given to the right of permanent sovereignty of each country concerned to develop its own resources;
>
> (b) The following principles should be considered by the States concerned when appropriate:
>
> (i) Nations agree that when major water resources activities are contemplated that may have a

significant environmental effect on another country, the other country should be notified well in advance of the activity envisaged;

(ii) The basic objective of all water resource use and development activities from the environmental point of view is to ensure the best use of water and to avoid its pollution in each country;

(iii) The net benefits of hydrologic regions common to more than one national jurisdiction are to be shared equitably by the nations affected;

(c) Such arrangements, when deemed appropriate by the States concerned, will permit undertaking on a regional basis:

(i) Collection, analysis, and exchanges of hydrologic data through some international mechanism agreed upon by the States concerned;

(ii) Joint data-collection programmes to serve planning needs;

(iii) Assessment of environmental effects of existing water uses;

(iv) Joint study of the causes and symptoms of problems related to water resources, taking into account the technical, economic, and social considerations of water quality control;

(v) Rational use, including a programme of quality control, of water resource as an environmental asset;

(vi) Provision for the judicial and administrative protection of water rights and claims;

(vii) Prevention and settlement of disputes with reference to the management and conservation of water resources;

(viii) Financial and technical co-operation of a shared resource;

(d) Regional conferences should be organized to promote the above considerations."[3]

These are modest objectives and guidelines vaguely drawn up. They do endorse the concept of river basin commissions or the like applied to international situations. From the point of view of the Great Lakes Basin, it can be said that all of the objectives and guidelines of Recommendation 51 and more are already provided for in the terms of reference of the International Joint Commission as amended by the 1972 Great Lakes Water Quality Agreement.[4] It is, of course, too early to assess the validity of this approach in the Great Lakes case. It was, however, the contention of the Canada-United States University Seminar that machinery designed to cope with single aspects of the total set of water resource management problems will prove to be deficient in important respects.

The United States Government, in preparation for the Stockholm Conference, sponsored a study by the National Academy of Sciences (NAS) on the subject of international institutional arrangements. The committee formed to carry out the NAS study submitted its report, "Institutional Arrangements for International Environmental Cooperation" to the Academy and thence the Department of State in the spring of 1972.[5]

The NAS Committee endorsed the establishment of an environmental unit within the United Nations supported by (1) the creation of "an independent global environmental science advisory and research board to provide scientific counsel to decision makers" and (2) the establishment of a world fund - "to support the nonhousekeeping activities of the UN environmental unit and to be administered by that unit to meet the costs of catalyzing global environmental action."

In addition, however, the NAS Committee recognized the role of national and regional organizations dealing with environmental problems.

The NAS group recommended "that the United States support current initiatives by regional organizations wherever such arrangements are instituted to address common problems of critical importance and where national capabilities are inadequate to deal with them effectively." The NAS Committee viewed regional organizations as filling a catalytic role as instruments to prod global organizations into action. The committee suggested that the range of management functions of such transnational or regional organizations include: surveillance, planning, and mediation of disputes and regulation. This set of functions happened to coincide precisely with those (surveillance, mediation and control) developed by the Canada-United States University Seminar. These functions are described later in Chapter III.

Finally, the NAS study conceived the institutional framework for environmental management as consisting of three separate yet interdependent levels: domestic agencies, regional or transnational entities, and a global unit within the UN system. The NAS study and, indeed, the Stockholm conference itself demonstrated the concern of those who must think and plan in global terms for the need to devise adequate institutional forms for the management of the world's resources. The Great Lakes study carried out by the Seminar, which is the starting point for this book, is a case study of one such transnational resource management problem - the Great Lakes.

Resource-Use Problems of the Great Lakes Basin

The Laurentian Great Lakes, which cover a total of about 95,000 square miles and drain an additional land area approximately twice as large, rank among the largest bodies of fresh water in the world. The

Great Lakes, lying on or adjacent to the border between the United States and Canada, are situated in the interior of the continent of North America. A connected chain, they are drained by the St. Lawrence River which flows northeast through the Province of Quebec to the Atlantic Ocean. The Great Lakes Basin lies between the latitudes of 40° 30' and 50°30' north, and between the longitudes of 70° 30' and 93° 10' west, thus covering a maximum span of 690 miles north-south and 860 miles east-west. The eastern limit of the Basin, near the end of Lake Ontario, is 600 miles inland from the Atlantic Ocean as measured along the St. Lawrence River. The western end of the Basin, near the west end of Lake Superior, is nearly halfway across the continent from the Atlantic. Approximately 60 percent of the Great Lakes Basin is in the United States covering parts of eight states with the remaining 40 percent in Canada spanning part of only one province, Ontario.

The water and land resources of the Great Lakes Basin have encouraged people and industry to locate in the region. It is here where the huge industrial and population complex of the North-Central United States joins the most industrialized and urbanized region of Canada. The Basin as a whole has a present population of 36 million which is expected to exceed 60 million by the end of this century. Demographers see the region as an emerging binational megalopolis which by the year 2000 is projected to contain over a third of the Canadian population and a quarter of the U.S. population.[6]

The effects of past population and industrial growth in the Great Lakes Basin on that region's water and related land resources are well documente'. There are serious water pollution problems in Lakes Michigan,

Erie and Ontario, and an emerging problem of asbestos fibers in Lake Superior; air pollution concerns in the Detroit-Windsor area and on the Niagara Frontier; fishery resource depletion in all the lakes; land use mismanagement associated with rapid industrialization and urban growth, and energy development and other resource management problems not necessary to detail here. These population and industrialization pressures on the finite resources of the Basin are increasing at an accelerating rate. Municipalities use the region's water for dilution of waste, nuclear power plants use lake water as a coolant for their reactors, and millions of people use the water environment for diverse recreation pursuits. Shipping is dependent upon water, and fish and wildlife require a natural ecosystem of which water is an essential part.

The present proliferation and expansion of these uses are putting considerable stresses on the physical limits of the water system of the basin. Furthermore, many of these uses conflict not only with the limitations of the resource, but also with other uses.

These systemic interrelationships notwithstanding, governments at all levels in both countries continue to treat these water problems as separate situations. Each of these major resources use areas has its own special cluster of public agencies and private organizations defending and promoting one use over the others. A competitive, special interest milieu exists in which different users of the same resource often find themselves working at cross purposes.[7] In such a setting, public policy decisions on competing water and land uses are seldom made using some

measure of net social benefit as the main criterion. In the Great Lakes the situation is further complicated by the fact that the waters are, to a large extent, binational.

As a way of illustrating the current resource use situation in the Great Lakes Basin, five problem areas are briefly surveyed.

Water Quality

Lake Erie, the western end of Lake Ontario and the southern end of Lake Michigan suffer from pollution in almost all its forms. Shoreline dumping and municipal waste discharges are a problem in Lake Superior and Lake Huron. The problems are by now well-researched and publicized. Furthermore, the problem of water degradation is not a new one. In the period 1912-1918, there was concern by the Federal authorities in the United States over Great Lakes pollution and infected water sources as they affected the spread of typhoid fever. Government interest quickly faded, however, when that disease was brought under control by drinking water purification processes and other advances in sanitary engineering. It was not until 1964 that the Canadian and United States Governments moved to investigate in an adequate way pollution in the lower Great Lakes and the international section of the St. Lawrence River.[8] The corrective measures recommended in that intensive study are only now being implemented and correction of the situation will require considerable additional time.

The basic causes of the serious water quality problems of the Great Lakes are the same as those of other regions. They include: reluctance of the federal governments to interfere in an area reserved by tradition to the states and the provinces; inadequate enforcement authority (and lack of will to enforce) on the part of the federal and state/provincial

pollution control agencies; a fragmented bureaucracy for regional planning and natural resources management; lack of funds; excessive number of political jurisdictions with overlapping authorities and responsibilities and a lack of precedent and experience in area-wide waste treatment management planning. This list is not complete, but it includes the more important obstacles to an integrated approach.

In the Great Lakes region an additional obstacle is encountered. The Great Lakes are shared (except for Lake Michigan) between two countries and this fact tends to inhibit joint, comprehensive efforts whether they be research undertakings, resource planning or clean-up of polluted air and water. This inhibitive effect is not a permanent obstacle, but rather a variable factor, inversely related to the determination of both countries to cooperate on the Great Lakes. An example of this is the 1972 Agreement between Canada and the United States, which has substantially increased the prospects for meaningful cooperation on transboundary water pollution.

The crux of the problem appears to lie in institutional inadequacies on both sides of the international border. While in recent years policy-makers in Canada and in the United States have made visible progress in improving the management of water, land, and environmental quality in the Great Lakes Basin, unfortunately, the effect of this effort is something less than it could have been simply because of the dampening effects of the existing fragmented institutional structure.

Fish and Wildlife

Concern over declining fish populations predates even the early, albeit transitory, interest in controlling water pollution. No less than 27 commissions and conferences since 1875 arrived at the same general conclusion that little progress would be made in halting the decline of fish populations in the Great Lakes until the fisheries were subjected to uniform federal and international control.[9] In 1955 the two nations established under treaty the Great Lakes Fishery Commission.[10] The Commission was created primarily as a response to the sea lamprey problem. Its broader stated objective is to improve the quality, abundance, and productivity of the fishery resources of the Great Lakes for sport and commercial use.

While the Commission has had considerable success in controlling the sea lamprey, neither the treaty nor the Commission has proved adequate in dealing with the problems of habitat destruction on a large scale or of the malevolent effects of pollution. Perhaps the major question facing fish and wildlife management in the Great Lakes Basin is how they may be protected against encroachment by competing and conflicting uses of the lakes environment. One example is the siting of thermal power plants and the effects that heat discharges have on aquatic life. Another example is the current high demand for wetlands, particularly near urban areas, as sites for construction projects or solid waste disposal. Accelerated eutrophication of wetlands caused by man can eventually destroy them as nesting areas for waterfowl.

The basic deficiency in fishery management of the Great Lakes is that the responsible public agencies are restricted to limited and narrowly defined roles. Stronger public agencies working under internationally agreed standards and objectives are required if the two countries are to achieve effective fish and wildlife management in the Great Lakes Basin.

Lake Level Control

With their vast drainage area of 295,000 square miles, a third of which is water surface area, the Great Lakes provide one of the best naturally regulated systems of fresh water in the world. This is demonstrated by the narrow range of variations in levels and outflows experienced prior to the advent of any artificial regulation on the lakes. The present ranges for monthly mean levels vary from 4.0 feet in Lake Superior to 6.6 feet in Lake Ontario. These are long-term averages, however, and they do not reflect periodic aberrations of high water (1951-1952) and low water (1964) which can and did have serious adverse effects on certain water users. High water during the winter of 1972-1973 again created concern along the lake shores.

During these episodes, unusual pressures are directed at public authorities to investigate the feasibility of further reducing lake level fluctuations by constructing adjustable control works to regulate outflows or by diverting water to or from areas outside of the Great Lakes Basin. As a result of concerted efforts by many interests in both countries, the Governments of Canada and the United States in 1964 requested the International Joint Commission to undertake a complete study of lake levels and their possible control.[11] The IJC study on lake levels was scheduled to be issued in late 1973.

The interests affected by variations in the levels and outflows of the Great Lakes are considered in three general categories: the shore property interests; the navigation interests; and the power interests. Shore property interests are all public and private lands and developments along the shorelines. It includes, among other things, cottages, water recreation activities, domestic water supply and sanitation, port facilities and industrial cooling water supplies. Shoreline interests are benefited by a reduction in the range of stage since they are adversely affected by extremes of both high and low levels. Navigation interests comprehend the water problems of commercial shipping on and through the lakes and connecting channels and include the related problems of recreational boating. Generally, navigation is served best by high lake levels. Hydropower interests are benefited by high water levels which help to ensure maintenance of minimum flows as large as possible.

Under the most favorable conditions, lake level regulation rules cannot ensure that each water user, throughout the system obtains the levels and flows best suited to his particular needs. However, rules are conceivable that would provide levels and flows that would result in generally beneficial conditions without unacceptable adverse effects to any interest.[12]

The whole matter of regulation of the levels and outflows of the Great Lakes cannot be other than international. Artificial control within the lakes of the water supply which comes from both countries cannot be undertaken without affecting the water use interests on either side of the international boundary. Changes in outflows and levels will, of

course, have similar international effects. The binational nature of lake levels and their effects was formally recognized in the 1909 Boundary Water Treaty with its specific injunctions against unilateral diversions and obstructions of boundary waters (Articles II through V).

Navigation

Waterborne commercial traffic on the Great Lakes has been a signigicant factor in the economic development of the region. Low-cost water transportation, coupled with the availability of adequate supplies of ore, coal, water and electric power have been decisive considerations in the location of such primary industries as the steel mills on Lakes Michigan, Erie and Ontario. The major present concern of navigation interests in the Basin relates to the modernization and improvement of this important industry.

A construction program is underway in Canada to make improvements on the Welland Canal and navigation channels of the St. Lawrence River. A new $180 million eight-mile section in the Welland Canal which bypasses the City of Welland was scheduled to be opened in 1973. The United States, independently, has had under study for a number of years a U.S. canal linking Lake Erie with Lake Ontario as a means of handling the anticipated increase in waterborne traffic in future years.

Shipping interests of the Great Lakes of both countries consider an extension of the present 250-260 day navigation season[13] on the Great Lakes-St. Lawrence Seaway absolutely vital to the system's long term viability and prospects for growth. The U.S. Congress in 1970 authorized a $6.5 million, three-year, interagency study and demonstration project to

determine the feasibility of extending the Seaway season to a full 12 months.[14] The results of this program thus far have indicated that an increase of one month in the shipping season is not an unrealistic goal.

Safety and pollution control are additional concerns of shipping interests and the regulatory public agencies. Dredging operations to facilitate shipping have produced problems of dredging material deposition, hydrologic change and modification of aquatic habitats. Control and enforcement authority available to deal with these problems under the water pollution control laws of both countries was, until quite recently, complicated, time-consuming and, on the whole, ineffective. The enforcement measures under the provisions of the U.S. Federal Water Pollution Control Act as amended in 1972, and the recently strengthened measures in Canada, provide improved opportunities for these aspects of water pollution control, but are as yet to be fully tested.[15]

Changes in lake biology have resulted from waterway development. The most notable of these changes was the introduction of the sea lamprey into Lake Erie and the upper lakes after completion of the Welland Canal. The Canal also permitted the alewife to circumvent Niagara Falls and enter the upper lakes.[16]

User charges have been an issue of major importance in the management of the Great Lakes-St. Lawrence Seaway facilities.[17] The Seaway is the only navigation works in the continental United States for which users are charged fees. The fee schedule in effect since the opening of the Seaway in June 1959 sets a base toll of 4¢ per ton plus 40¢ per ton for bulk cargo and 90¢ per ton for general cargo (no charge is currently

made for tonnage-in-transit). This original toll accord between Canada and the United States expired in 1966 touching off a vigorous debate. Atlantic and Gulf coast interests pushed for toll increases for the Seaway while Great Lakes interests proposed a decrease or even elimination, claiming that the tolls represented a discriminatory burden on the economies of the Midwest. The proponents of a toll increase based their arguments on the fact that during the first several years of operation, tonnage volume moving through the Seaway system was considerably below original (and overly optimistic) expectations and, consequently, debt repayment schedules were affected. Great Lakes shippers, on the other hand, claim that it is not at all certain that toll increases would in fact raise revenues. The Canadian Government, which financed 71 percent of the original Seaway construction, bears a correspondingly larger share of the long-term debt and thus favors a modification of the toll accords to allow increases in user fees at both the St. Lawrence and Welland locks. Great Lakes shippers of both countries maintain opposition to increases, arguing that current tolls already constitute a substantial portion (around 20 percent) of their costs. The issue over tolls was ameliorated, at least temporarily, when the U.S. Congress passed the Merchant Marine Act of 1970, which, among other things relieved the St. Lawrence Seaway Development Corporation (U.S.) from payment of accrued as well as future interest charges on the principal debt of the U.S. section of the Seaway.[18] A favorable trend for the Seaway system is the steadily increasing use of the waterway, gross tonnage in 1971 rising to 53 million short tons, compared with the

estimated breakeven point of 42 million[19] short tons per season. Nonetheless, the toll issue remains and the mechanism that would be used in resolving this difficult problem has not yet been devised.

Urban and Industrial Land Use

In the context of this brief discussion, "urban and industrial land use" refers primarily to the effects of urban development and industrial development on the use of the land resources of the Great Lakes Basin. It goes almost without saying that the basic economic issue that must be confronted by the people of the Great Lakes region is how best to allocate the available water and land resources among competing uses and to resolve the inevitable conflicts that arise as growth pressures continue to increase in the region.

Water uses are interrelated; that is, each use affects in some way each of the other uses. The allocation of water, and indeed related land resources as well, involves a continuous series of trade-offs which seek to meet agreed-on social objectives while reducing conflict. Economic factors play a central role in this process; they provide a major mechanism for working toward some mix of resource allocation which, theoretically at least, will provide the maximum level of possible benefits for the most people. Needless to say, there are great problems associated with achieving these objectives through economic processes alone. Political, social and institutional factors impinge on and influence public decision-making processes, which, more often than not, produce

something far less than the optimal economic solution to public problems. Another source of suboptimization in a purely economic sense is the inherent problem of measuring all costs and benefits associated with the selection of alternatives. Finally, there is the problem of measurement and allocation of external costs, which, historically, have not been comprehended in economic and political calculations. Much of the current concern over the "environment" is a belated recognition of the inequitable allocation of these externalities.

In spite of the difficulties involved, the problems created by competing demands on finite public resources must be confronted economically. They must be dealt with both in terms of external diseconomies as well as traditional notions of costs. Consideration should be given to ways of introducing into the calculus of economic trade-off and compromise a much higher level of non-market influence in order to protect the interests of all sectors of the society. Natural resources and their allocation should not be the exclusive concern of those particular groups possessing the economic and political clout to exclude other sectors of society. The increasing use of the courts, particularly in the United States in response to the National Environmental Policy Act of 1969,[20] has yielded some visible progress in restraining uncontrolled exploitation of our key resources or unique places of natural beauty. It is a constant struggle and one destined to become even harder fought in the future.

For all intents and purposes, economic development occurs in both countries in response to market forces, limited in the most nominal sense and in only some cases by government regulatory agencies (and even then ofttimes not very well). Planned economic development as such does not exist; neither Canada nor the United States subscribes to any concept

of a planned economy. Both countries, however, have evolved some legislative tools (e.g., Employment Act of 1946)[21] and institutional devices (e.g., Council of Economic Advisory in the U.S. or the Economic Council of Canada) to guide their respective economies along certain general lines, such as increased and sustained economic growth. Increasing Gross National Product, minimizing unemployment and controlling inflation make up the essential elements of our respective national economic policies. The states and provinces simply endorse this growth policy as the generally accepted economic goal.

While most urban development still takes place without benefit of effective planning, a widespread planning institutional base has been established in both Canada and the United States. Recent legislative activity in the U.S. proposes stronger government land control policies and this issue is becoming more urgent in Ontario largely as a result of the urbanization in the lower Great Lakes. There are some good instances of land use planning at the provincial level, for example, the Toronto Centred Region[22] and in other regional studies by the Province of Ontario. Land use planning experience in the United States has been strengthened by programs in Hawaii[23] (Land Use Commission), Vermont[24] (Environmental Control Law and Environmental Board), Wisconsin[25] (shoreland protection program under the State Water Resources Act of 1966) and in New York State[26] (Agricultural Districts). (See Bosselman and Callies, The Quiet Revolution in Land Use Control, a comprehensive study of the subject prepared for the Council on Environmental Quality.)[27]

Summary

In the Great Lakes Basin, a number of contradictory trends can be seen. One is the past, and perhaps even present, trend toward the

increasing misuse of air and water for waste disposal. At the same time there is a rapidly increasing demand for water of improved quality for a host of urban needs and also for the health and aesthetics of recreation. There is an increasing desire to use the shoreline for recreational purposes yet simultaneously in the same areas there are pressures for industrial and urban development. There are increasing demands to use the Great Lakes for a major shipping route; to use more of the water for industry, for irrigation and for power station cooling; to use more of the water for waste disposal; and to use more of the shore for more complex uses. In short, we are imposing on the Great Lakes a great number of intensely conflicting demands. This situation calls for a very complex and carefully devised planning system in both countries which together must deal with the total Basin.

Development planning on a joint basis is now a prerequisite to intelligent and efficient management of the resources of the Great Lakes Basin. This does not mean that Canada and the United States need to march in lock-step. It would suffice if they could be persuaded that the mutual interest is best served by proceeding in cooperation to correct the present wasteful and uncontrolled manner in which the resources of the Basin are used.

In summary then, the present state of affairs in the Great Lakes Basin is as follows: The water and related land resources of the Basin although extensive are nonetheless finite. The region is an emergent megalopolis and the growth processes have already begun to tax severely the resources of the Basin. Resource-use gravitates to the politically strong, and public policy decisions on competing uses are seldom made

using net social benefit as the main criterion. A Great Lakes regional approach is required but as yet does not exist. Responsibility in the government sector for resource management is seriously fragmented and a functional, reactive approach currently predominates. Multiple political jurisdictions, especially on the United States side of the border, complicate efforts to improve resource management in the Basin. The negative effects of overlapping jurisdictions are sharpened because of the fact that two nations share the same resource system.

CHAPTER II

THE INTERNATIONAL JOINT COMMISSION

The International Joint Commission (IJC) was of particular interest to the Canada-United States University Seminar study because it is at present the main institutional vehicle through which Canada and the United States cooperate in attacking Great Lakes problems. This chapter reviews the responsibilities and activities of the IJC with a special focus on the Great Lakes region.

Structure and Principal Functions

The only existing formal arrangement between the United States and Canada broad enough in scope to permit comprehensive joint action on resource-use problems of the Great Lakes Basin is the International Joint Commission (IJC).[28] The Commission was formed in 1912[29] to carry out the purposes of the Boundary Waters Treaty of January 11, 1909, which are: "...to prevent disputes regarding the use of boundary waters and to settle all questions which are now pending between the United States and the Dominion of Canada involving the rights, obligations or interests of either...along their common frontier, and to make provision for the adjustment and settlement of all such questions as may hereafter arise."[30]

The Commission consists of six members, three from each country. The United States Commissioners are appointed by and serve at the pleasure of the President.[31] The appointment of U.S. Commissioners is not subject to Senate confirmation.[32] The Canadian Commissioners are appointed by Order in Council of the Canadian Government and serve at the pleasure of the Government.[33]

The 1909 Treaty gives the Commission responsibility in two general categories.

The first of these responsibilities is to approve or disapprove of all proposals for use, obstruction, or diversion of boundary waters on either side of the boundary which would affect the natural level or flow of the boundary waters on the other side. Examples in the Great Lakes system include the regulating works at Saulte Ste. Marie, those on the St. Lawrence River as well as numerous private dams constructed by industrial firms that might affect the natural state of the boundary waters. These projects are brought before the IJC by what are termed "applications,"[34] filed by interested public agencies or private corporations or individuals.

The second general responsibility of the IJC - which is becoming the major work of the Commission - is to investigate and make recommendations on specific problems referred to it by either or both Governments.[35] It is under this provision of the treaty that requests - or "references" - by the two governments have been made on such varied subjects as water pollution, air pollution, regulation of the levels of the Great Lakes, preservation of the American Falls at Niagara, and others.

In the case of an application, the burden is on the applicant to furnish all necessary information and data required. Interested persons may intervene in support of or in opposition to the application. This is followed by public hearings usually on both sides of the boundary, after which the Commission issues an "order" concerning the proposed project, which is final.[36]

In the case of references, the procedure is different. The Commission appoints an international technical board which is directed to make a thorough investigation of the facts involved and file a written report with the Commission. The IJC then publishes the board report and schedules public hearings. The Commission then prepares its report to the two Governments. Neither Government is bound by the reports or recommendations of the Commission.[37]

As of December 1972, the Commission had recorded a total of 95 actions, including 58 applications and 37 references.[38] Of that total, 26 actions pertained in some way to the water, land or air resources of the Great Lakes Basin (see chronological summary).

The Commission carries out its varied responsibilities through a series of permanent and ad hoc boards. As of December 1972, the Commission had under it 13 boards of control, seven boards of investigation, and eight surveillance boards. This does not include the new Great Lakes Water Quality Board established by the Commission pursuant to the Great Lakes Water Quality Agreement signed by the two countries in April 1972.[39] The new Water Quality Board will be the instrument through which the Commission will carry out its role in controlling transboundary water pollution in the Great Lakes.[40]

CHRONOLOGICAL SUMMARY OF ACTIONS OF THE INTERNATIONAL JOINT COMMISSION
IN THE GREAT LAKES BASIN

	Docket No.		
1912-1920	4-1912	POLLUTION	GREAT LAKES
	5-1912	NAVIGATION	DETROIT RIVER
	6-1913	LAKE LEVEL	ST. MARY'S RIVER DAM
	8-1913	LAKE LEVEL	ST. MARY'S RIVER DAM
	13-1916	FLOW REGULATION	ST. CLAIR RIVER
	14-1918	HYDROPOWER	OGDEN ISLAND
	15-1918	HYDROPOWER-FLOW REGULATION	MASSENA WEIR
	17-1920	HYDROPOWER-NAVIGATION	ST. LAWRENCE RIVER (aborted treaty)
	1920	END OF REFERENCE #4 - NO ACTION	
1921-1930	21-1925	BRIDGE FORT ERIE-BUFFALO	
	24-1928	HYDROPOWER-FLOW REGULATION	MASSENA WEIR
1931-1940		No references or applications received.	
1941-1950	54-1946	POLLUTION	CONNECTING CHANNELS, LAKES SUPERIOR, HURON & ERIE
	55-1948	POLLUTION	CONNECTING CHANNELS, LAKES ERIE & ONTARIO
	61-1949	AIR POLLUTION	WINDSOR-DETROIT
1951-1960	64-1950	UNIQUE RESOURCE PRESERVATION	NIAGARA FALLS
	67-1952	LAKE LEVELS	LAKE ONTARIO
	68-1952	HYDROPOWER-NAVIGATION	ST. LAWRENCE RIVER
1961-1970	74-1961	FLOW REGULATION	NIAGARA FALLS
	75-1961	FLOW REGULATION	NIAGARA FALLS
	78-1963	FLOW REGULATION	NIAGARA FALLS
	82-1964	LAKE LEVELS	GREAT LAKES
	83-1964	POLLUTION	GREAT LAKES
	85-1966	AIR POLLUTION PORT HURON-SARNIA	DETROIT-WINDSOR
	86-1967	UNIQUE RESOURCE PRESERVATION	NIAGARA FALLS
	88-1968	DIVERSION	LAKE ST. LAWRENCE
1971-	94-1972	POLLUTION	LAKES SUPERIOR & HURON
	95-1972	LAND USE POLLUTION	GREAT LAKES REGION

Some Observations on the IJC and Its Work

The International Joint Commission was established in January 1912 pursuant to the provisions of the Boundary Waters Treaty of 1909. It has been in continuous existence for 62 years. The Commission was originally conceived and promoted as a bilateral, quasi-judicial body to provide speedy and equitable resolution of those occasional and mainly minor border disputes that arose among citizens of Canada and the United States and which were, therefore, beyond the jurisdiction of ordinary courts of both countries. Prior to the formation of the Commission, referral of such disputes to the Department of State or to the British Government more often than not led to lengthy diplomatic correspondence between Washington and London. Excessive delays and presumed bureaucratic inaction tended to feed suspicions and arouse national feelings to the point that minor border controversies were at times given attention that was out of proportion to their actual importance. In short, the drafters of the 1909 Boundary Waters Treaty sought to create an instrumentality that could help prevent boundary controversies as well as resolve with minimum delay any that did arise.

It can be said that the Commission has faithfully carried out the tasks assigned to it. While its assignments, for the most part, have not been those of major political significance, the Commission has fulfilled the treaty mandate in a satisfactory manner. The Commission has had a long life. It would be unjust, however, to attribute longevity in this case to the endurability of temporary commissions or boards. The Commission is still around primarily because (1) the need for which it was designed has itself persisted, and (2) nothing better has yet surfaced to take its place.

It is of interest to note that there has been only one instance in its long life in which the Commission and its purpose were challenged in the U.S. Congress. The first and only serious discussion in the United States Senate to consider terminating the treaty took place on February 27, 1913 when a doubting Senator William Borah asked why the Commission had "made no report and consummated nothing in the way of final settlement." The reply was made by Senator Elihu Root, who in 1909 signed the Boundary Waters Treaty as Secretary State. Root strongly defended the Commission. Regarding the need for it over the long term, he said:

> "I do not anticipate that the time will ever come when this commission will not be needed. I think that as the two countries along this tremendous boundary line become more and more thickly settled, the need for it will increase. I do not think we shall ever see the time when this commission will not be needed to dispose of controversies along the boundary line in their inception, furnishing a machinery ready at hand for people to get relief and redress without going into the long process of diplomatic correspondence. I think it will have to continue as long as the ordinary courts of the country continue."[41]

This exchange on the Senate floor in 1913 was the last occasion of any discussion in the U.S. Congress that might have led to the abrogation of the 1909 Treaty on the part of the United States.[42]

Aside from its stamina and its record of serving its intended purpose, the IJC is unique in other ways. One of these is its excellent record of impartiality. The philosophy of the original negotiators of the treaty was that problems between the two countries were to be resolved "not by the usual bilateral negotiation, but in the joint deliberations of a permanent tribunal composed equally of Canadians and Americans "[43] There was to be a majority rule, irrespective of nationality.

The Commission has an impressive record of honoring this concept. According to A.D.P. Heeney, Chairman of the Canadian Section (1962-1970) and Matthew Welsh, Chairman of the United States Section (1966-1970), the Commission had divided along national lines or failed to reach unanimous agreement in only three decisions out of a total of some 80 docket cases submitted to the Commission up to that time (1967-1969).[44, 45] This impressive absence of national advocacy in a bilateral forum places the IJC in a category by itself. The question arises as to what will happen to this impartiality as the Commission's responsibilities increase and its assignments become less technical and more political in nature. As time goes on the two governments may "prove less inclined to respect its traditional independence."[46] In our view, this concept of decision-making by majority rule regardless of nationality is the proper way for such a commission to carry out its business and we hope that this tradition can be preserved or passed on as a legacy to any successor organization which may be established in the future by the two countries.

A reputation for being nonpolitical attaches to the Commission. While it is true that commissioners are appointed and serve at the pleasure of their respective governments, and that some appointments have been terminated to make room for individuals considered more qualified by the particular administration in power, this is about as far as the political process intervenes in the functioning of the IJC. It has not been the practice by either country to appoint, as a matter of course, new commissioners whenever a new government is formed. The relative absence of partisan politics within the IJC has not only facilitated its work, but it has also enhanced its overall credibility and reputation.

Another feature of the Commission is the modest size of the permanent staff and operating budget of both the U.S. and Canadian Sections. The size of the full-time staff of the U.S. Section has remained virtually constant at five persons since 1913[47] and the administrative budget has increased from $42,000 in fiscal year 1914[48] to about $300,000 in fiscal year 1973,[49] an amount which is essentially constant when the effects of inflation over the intervening years are taken into account. The Canadian Section has also remained small, and currently consists of eight persons, including one Commissioner on a full-time basis.

As a result of the 1972 Great Lakes Water Quality Agreement, the IJC has undergone an expansion of its permanent staff. The U.S. Section plans to increase its Washington complement to approximately five professionals. The newly authorized regional office is located in Windsor, Ontario and is planned to have a staff of 16, including ten professionals, half from each country.[50]

The IJC was originally conceived and created by treaty as a court of arbitration. Like any court, the IJC assumes a passive role. It lacks authority to act until either (1) an application for approval of works or (2) a reference from one or both governments is received. Its holdings ("orders") with regard to applications are final, having the force of law in both countries. On the other hand, in the case of a reference, its role is much more limited. Upon receipt of a reference, the Commission will temporarily assume investigative, administrative and recommendatory functions which are specified by the terms of the reference. When an investigation has been completed, the IJC makes recommendations

to the Governments. There is nothing in the treaty requiring either country to act upon such recommendations.

In recent years, the number of applications received by the Commission has diminished while the references submitted to the Commission have tended to increase. The IJC finds itself more and more in the role of coordinating large-scale joint studies (water pollution of the Great Lakes 1964-1969 and lake levels, 1964-1973) and of making recommendations thereon to the two governments.

The IJC is reactive as opposed to initiatory. Its principal tasks, once the organization is set in motion, are coordinative and recommendatory. Its present form and methods of operation are faithful reflections of the carefully and conservatively written provisions of the 1909 treaty.

The IJC was not granted a planning role with respect to the boundary waters by the treaty. Thus, the Commission has neither the authority nor the resources with which to undertake a planning function, much less to develop a program designed to attack the mismanagement of the boundary waters. Its contribution has been the resolution of problems on a case-by-case basis as they arose and as they captured sufficient federal government attention to result in the required reference.

It is sometimes asserted that the IJC need not maintain a large technical staff to carry out the investigations authorized by reference since it can draw upon the federal agencies of both countries for these purposes.[51] This is a situation not without its drawbacks. When the technical work of the Commission is carried out by the agencies of the two governments, and this by necessity has always been the case, the

work produced is a product of the priorities, constraints, funding and program biases of the participating agencies. While the Commission, at the onset of an investigation, has and exercises authority to mark out the scope and terms of the project, this power tends to dissipate in an irreversible manner once the project is firmly in the hands of the technical agencies. Since the Commission has no fiscal control or continuous supervisory control over the work done in its name by the agencies, it can do little more than place its imprimatur on whatever the agencies come up with, whenever they come up with it.

Visibility of the IJC

Notwithstanding its sixty-year existence, the Commission and its work are virtually unknown to the general public in the United States and Canada. For many years the Commission's primary function was the processing of applications for projects involving private concerns or at best very local interests. The Commission quietly and effectively carried out its treaty mandate in this regard. The fact that the Commission has seldom if ever gained national attention on either side of the international border, while duly noted here, cannot be regarded as a reflection on the Commission. Success in international problem-solving is measured just as much by what does not take place as what does. Indeed, an argument could be made that the low profile of the Commission has been one of its strengths.

While a lack of awareness on the part of the general public is understandable and represents no cause for concern, a more serious matter is the low level of interest evinced thus far by such institutions as

the federal legislatures and academe. In the case of the U.S. Congress, a review of the Congressional Record undertaken by the Canadian-United States University Seminar disclosed that in the 31 Congresses, elected between 1910 and 1970, on only about 14 occasions (in about as many days) in ten Congresses had there been any substantive discussion of the IJC or its activities (excluding some infrequent questions raised concerning annual appropriations). The last time the utility of the Boundary Water Treaty was questioned in the Senate was during the aforementioned Borah-Root exchange of 1913; and in the House between Rep. Tawney (later the first Chairman of the U.S. Section) and opponents of the Commission in 1911.[52] This original interest was followed by a hiatus of nearly 40 years until the high water levels of the Great Lakes in the early 1950's, the Columbia River Basin Project, and the St. Lawrence Seaway Project stirred renewed interest in the activities of the Commission. While recognizing that the IJC is of continuing interest to certain members of Congress and particularly those from the states on the northern border, it is nevertheless true that there has not been much interest shown in the Commission by Congress as a body.[53,54]

While no similar review was carried out with respect to recorded interest by the Canadian Parliament in the activities of the IJC, Canadian members of the Seminar were of the opinion that the IJC seems never to have been a major concern in Parliament as well.

Academic research on the 1909 Treaty and the IJC has been scant in the past but has steadily improved in the last 15 years. The main impetus of this research interest seems to be the problems of water quality in the Great Lakes and an appropriate role for the IJC in that regard.

Among the reasons for the general lack of interest in the Commission and its activities are, perhaps, the nature of the institution itself. The operating procedures of the Commission and its close ties with the U.S. Department of State and the Canada Department of External Affairs effectively isolate it from public involvement in the usual sense. Its rule of procedure in some instances preclude public access, e.g., IJC established technical boards may not hold public hearings, this power being reserved to the Commission itself.

Its lack of public visibility to date, notwithstanding, it may be presumed that that era in the life of the Commission is now ending. The Great Lakes Water Quality Agreement will, if it is vigorously implemented, thrust the IJC into public view and the political arena to a degree that it has never been before. As the Commission assumes greater responsibilities, its politicization has to increase, a phenomenon that will significantly alter both the character of that body and its operational relationships with those agencies and organizations with which the Commission has customarily done business. It has been suggested that a more politicized IJC might actually enhance its usefulness, since a politically responsive Commission might be trusted with regulatory or enforcement powers.[55]

The Issue of Senate Confirmation

The U.S. Commissioners of the IJC are appointed by the President without Senate approval. This policy was challenged by Senator Neuberger (D-Ore.) and four other senators on the occasion of the appointment in 1957 of former Secretary of the Interior, Douglas McKay, to succeed Len Jordan, former governor of Idaho, as chairman of the United States Section of the IJC. Senator Neuberger criticized the 1955-56 "deadlock"

within the IJC over the Columbia River Basin reference and expressed the opinion that Mr. McKay was an inappropriate choice to replace Mr. Jordan. Senator Neuberger took the position that the U.S. Commissioners "play roles at least comparable to those of senior officers in the (U.S.) Foreign Service," thus their appointments should also "be made subject to confirmation by the United States Senate." He asked: "Where else, in our Government, can the President make a $20,000-a-year appointment of indefinite term without Senate confirmation?" (See 103 Cong. Rec. 12271, 1957.) The essence of his stand was that the very fact that an appointee must face the scrutiny of a confirmation hearing and Senate vote means that the Chief Executive will accommodate his important appointments to the limits of acceptability of the Senate. Senator Neuberger and co-sponsors introduced two bills, one in the 85th Congress (S. 2602) and one in the 86th Congress (S. 2594) requiring Senate confirmation of U.S. Section commissioners of the IJC. Neither of the two bills was reported out by the Foreign Relations Committee.

The Seminar took no position on the question of Senate confirmation of U.S. Commissioners, believing it a matter better left for the consideration of the appropriate leaders in the Congress and the executive branch.

Water Pollution in the Great Lakes and the IJC

Interest in the pollution of the Great Lakes antedated the Treaty of 1909. Typhoid fever at the turn of the century ranked as one of the major health problems in the United States and Canada. The link between polluted water supplies and the spread of typhoid fever had been established in the U.S. by 1907. This and subsequent breakthroughs in bacteriology stimulated government epidemiological investigations of typhoid fever.

Stream and lake surveys were indicated but the federal agencies had no legislative authority to undertake them until the passage of the Public Health Service Act of 1912. The states and provinces had exclusive jurisdiction over the pollution of waterways and the initiative had to emanate from that level. In 1908, at the recommendation of the Mayor of Chicago, an interstate commission to study and report on pollution in Lake Michigan was formed. The cooperation of the Public Health Service was requested and the Service responded. Later that year a similar group composed of representatives of cities on Lake Erie was organized to collect data, "and excite interest regarding the necessity of protecting water supplies." The findings of both groups pointed to the need for legislation to prevent pollution of interstate waters. Such legislation was introduced in the Congress, but was not enacted.

Public and governmental concern over the relationship between typhoid fever and polluted water supplies found expression in the 1909 Treaty in the form of a single sentence appended to Article IV:

> "It is hereby agreed that the waters herein defined as boundary waters and waters flowing across the boundary shall not be polluted on either side to the injury of health or property on the other."

Any ideas of a prompt contribution by the newly authorized Commission to the need for a joint survey of the boundary water pollution problem were dashed by the three-year period required to ready the Commission for business. Even if the IJC had been prepared to function earlier, a reference on Great Lakes pollution would have been an empty gesture considering the fact that, on the United States side, no federal agency had, at least

until August 1912, either legislative authority or the funds to engage in investigations of pollution in the nation's waterways.[56]

In actuality, however, stream pollution investigations date from 1910, when Dr. Allan J. McLaughlin of the Public Health Service was detailed to make a survey of cities in the Great Lakes region, with instructions to investigate the extent of pollution of their water supplies, and its relation to the prevalence of typhoid fever and other water-borne diseases. These studies (1910-1911) disclosed the high typhoid fever rates existing among the populations of cities along the Great Lakes and showed that their conditions were largely attributed to the sewage - polluted public water supplies which had their sources in the lake waters.

On August 14, 1912 Congress enacted the first law directly aimed at the problem of water pollution by authorizing the Public Health Service to investigate "the diseases of man and conditions influencing the propagation and spread thereof, including sanitation and sewage and the pollution, either directly or indirectly, of the navigable streams and lakes of the United States." In 1913, the first special appropriation for field investigations by the Public Health Services was made by Congress.

In another action in August 1912, the governments of the United States and Canada sent the IJC a reference (Docket #4) requesting the Commission to examine:

> "1. To what extent and by what causes and in what localities have the boundary waters between the United States and Canada been polluted so as to be injurious to the public health and unfit for domestic or other uses?"

2. In what way or manner - is it possible and advisable to remedy or prevent the pollution of these waters - to fulfill the obligations undertaken in Article 4 of the waterways treaty of January 11, 1909...?"

At a meeting in Ottawa in October 1912, the new reference was considered by the IJC and it was decided to request clarification as to the intended scope of the investigation. The response from the Department of State on behalf of both Contracting Parties in November 1912 confined the investigation "to cases of pollution of boundary waters on one side of the boundary which extend to and affect the boundary waters upon the other side."[57]

The Commission secured the services of Dr. McLaughlin of the PHS and T. A. Starkey of McGill University to lead the investigation. Professor Earle B. Phelps, an eminent sanitary engineer from Columbia University, was hired as a consulting engineer. This highly competent team began its investigation in March 1913. The survey centered around the connecting channels but some deepwater investigations were made with the assistance of the U.S. Coast Guard. The comprehensive reports of Dr. McLaughlin (January 16, 1914) and Prof. Phelps (March 16, 1916) on their findings, which still stand as classics in the field of water pollution examination and control, described a generally unsatisfactory situation. Vivid language was used such as:

"---situation along the frontier which is generally chaotic, everywhere perilous and in some cases disgraceful."[58]

"---imperil the health and welfare of the citizens...in substantial contravention of the spirit of the Treaty..."[59]

Sewage from vessels, from cities and industries was identified as the major cause of pollution. Remedies could be provided by treatment plants.

The Commission issued its final report on August 12, 1918 with the recommendation that it be granted "ample jurisdiction to regulate and prohibit this pollution of boundary waters and waters crossing the boundary."[60] The two governments requested the Commission on March 11, 1919 to draft either reciprocal legislation or a treaty to carry out its recommendations. On October 6, 1920, the Commission submitted a draft convention which would have given it authority to investigate any alleged violation of Article IV of the Treaty. In addition, its findings of fact were to be "final and conclusive" and the two governments would have been obligated to prevent a continuation of the breach. The proposed convention was never negotiated to conclusion. Aside from the obvious concern over vesting the Commission with such broad powers, there was a reluctance on the part of both federal governments to legislate in an area in which the provinces and the states had exercised full jurisdiction.[61] By 1920 the stance of inaction with regard to the proposed convention was a defensible one because by then the widespread acceptance of water supply filtration and chlorination had effectively eliminated typhoid fever as a menace to public health.

The next activity of the Commission concerning boundary water pollution came much later. On April 1, 1946 a reference, similar in wording to its 1912 predecessor, was sent to the Commission to cover the St. Clair River, Lake St. Clair and the Detroit River.[62] In October 1946, the reference was extended to include the St. Mary's River and

in April 1948 was further amended to include the Niagara River.[63] The IJC carried out an investigation and issued its report in October 1950. The report recommended adoption by the two governments of water quality objectives as criteria to control water quality.[64] The two governments approved the recommendations, authorizing the Commission to establish and maintain continuing supervision over pollution in the connecting channels of the Great Lakes. Advisory boards on control of pollution of boundary waters were set up which included the states and provinces as well as federal representatives. These boards report to the Commission semiannually on the extent to which the water quality objectives are being met. These boards, insofar as the Seminar was able to determine, have had no discernible effect on the problem of pollution of the Great Lakes.

This discussion can best be tied together by leaning on the work of the Canadian scholar Frederick J. E. Jordan, who, in a 1968 paper, examined the limits on institutional arrangements with respect to pollution problems of joint concern to Canada and the United States.[65] He pointed out that both countries, since World War II, have turned increasingly to the IJC as the indicated joint agency for handling transboundary pollution problems.[66] Jordan identified three major limitations that are placed on the IJC in carrying out an effective role in this area.[67] First, the treaty does not grant the Commission specific (or general) jurisdiction over boundary pollution matters, it must await a reference from the two governments, a procedure entailing delays; second, once it has a reference, it has no power to direct or coordinate

the research or information-gathering being done by domestic agencies at the various levels of government, resulting in duplication of activities and lack of communication on means and ends. Third, there is the lack of power to give effect to the standards and measures of control recommended by the IJC following completion of its investigation. Jordan stated that this third limitation may be viewed from two levels. First, the Commission has no powers of compulsion on the federal governments and second, it has no way of imposing its standards on the local governments or individuals causing the pollution. In addition, while the two federal governments may "adopt" the Commission's recommendations, in the absence of legislative enactments to give legal effect to them, "their implementation and enforcement remain academic."[68] The Commission's powers are reduced to those of good will and persuasion.

Jordan rules out the establishment of a supranational pollution control agency. Instead, he recommends that the two governments

> "vest the Commission with jursidiction over all matters of boundary water and air pollution which were having transboundary effects in relation both to initiating the investigation without waiting a reference and to coordinating the various bodies involved in the study."[69]

Also recommended was that the IJC "be empowered to exercise supervision over the implementation of its recommendations by the users of the resource which has been the subject of the Commission's study and be authorized to report offenders to the federal Attorney General of the appropriate national government with recommendations for the action to be taken." This procedure, he noted, would first require legislation enabling the attorneys general to launch compliance proceedings.[70]

The three institutional limitations singled out by Jordan are not significantly altered by the 1972 Great Lakes Water Quality Agreement. The intent of the agreement is to enable both countries to mount a more effective pollution control program for the Great Lakes. It assigns to the Commission the principal coordinative role in that effort. While the agreement relieves the situation on research coordination, independent monitoring and public reporting, the agreement fails to address the other two fundamental limitations, i.e., the reference requirement and lack of enforcement authority.

A Future Role for the IJC?

The most complete and authoritative study of the entire range of Canadian-United States relations that has appeared in recent years was the 1965 report entitled "Canada and the United States-Principles for Partnership" authored by former Ambassadors Livingston T. Merchant of the United States and A.D.P. Heeney of Canada.[71, 72]

While the emphasis of the report is on the economic issues between the two countries, Ambassadors Merchant and Heeney address themselves to nearly every significant aspect of the bilateral relationship. In the section entitled, "Machinery for Consultation," the authors consider the International Joint Commission.[73] Ambassadors Merchant and Heeney described the Commission as "one which has been of continuing importance to both countries since its establishment" and as a "unique institution" with "a solid foundation of law and precedent" and a "long and successful record in the disposition of problems along the boundary" which "justify consideration of some extension of the Commission's functions."[74]

They accordingly recommend that the two Governments "examine jointly the wisdom and feasibility of such a development."[75]

In the White House press release issued on the Merchant-Heeney study, it was stated that President Lyndon B. Johnson "believes this report is a serious and constructive contribution to still better relations between Canada and the United States." The statement added that the Secretary of State is to "take the lead for the United States in a prompt review of the report and its recommendations."[76]

Shortly after the Merchant-Heeney report was made public, ten Republican House members inserted into the Congressional Record their own statement on United States-Canadian relations.[77] The Congressmen lauded the Merchant-Heeney report as "a skillfully written document prepared by two masters of the diplomatic art" but then admitted to "a perspective on United States-Canadian relations which differs in degree from that embraced in the Merchant-Heeney report."[78] The Republican statement was also extensive in scope and well-written. The commentary it contained on the IJC is of special interest. The House members were willing to be more explicit in sketching out a wider role for the IJC than were Ambassadors Merchant and Heeney. Paragraph 14 of the Republican statement, for example, began by stating that the 1909 Treaty "should be negotiated so as to broaden the functions of the Commission." The Merchant-Heeney recommendation regarding the IJC was endorsed and the statement was made that "it (IJC) may be the institution which can bring new excellence in the relations between the two countries in fields with which it is not presently authorized to deal."[79] The House members said, "We believe that expansion

of the authority of the International Joint Commission, in accordance with the following recommendations, would enhance the capacity of the two North American nations to establish a model of relations between independent states."[80] Among the recommendations alluded to in the foregoing were: (1) Inclusion of Lake Michigan in the definition of boundary waters (paragraph 15); (2) the IJC to be empowered to make recommendations relating to continental development of water and energy resources (paragraph 16); (3) the IJC to constitute a permanent institutional location for international discussion of technical foreign policy questions which arise between the two nations (paragraph 17); (4) the IJC studies on water levels and pollution of the Great Lakes should be given immediate priority emphasis by both countries (paragraph 18); and (5) the IJC should have a leading role in fulfilling "the obvious need for comprehensive advance planning in the development of water resources" (paragraph 19).

Elihu Root's statements in 1913 on the continual need for the IJC were indeed prophetic. The border complications have continued and the Commission still offers the only readily available machinery for resolution. The Commission over the years has faithfully carried out this unspectacular but necessary duty. It is a narrow role, circumscribed by an instrument that reflects the limits of political acceptability of a world that existed over 60 years ago.

Does the IJC have a potential role in an integrated management scheme for the Great Lakes? The answer is a qualified yes. The sine qua non is strong revision or replacement of the 1909 Boundary Waters Treaty.

In the consideration of such a role, several relevant questions will have to be addressed. They include: (1) Would the organizational attitudes and traditions acquired over 60 years impede the successful transmutation of the IJC, (2) Should the IJC continue to carry out its original treaty mandate, simultaneously complementing the activities of a new agency created especially by treaty to coordinate integrated management of the Great Lakes, (3) If a new agency is charged with these responsibilities, should it have exclusive jurisdiction or should it share responsibility in some way with the IJC?

These and other related issues are taken up in the next chapter.

CHAPTER III

THE SEARCH FOR INSTITUTIONAL IMPROVEMENTS

In the process of developing the general features of an improved institutional structure for water and related land resources management in the Great Lakes region, the Seminar experimented with a number of different approaches. One of the first avenues explored was a review and analysis of the various types of organizations which are either in use or which have been proposed to carry out some public purpose relating to the management and development of natural resources.

Organizational Review and Analysis

There are many such organizations and the following list, while not exhaustive, illustrates the wide range of options in this regard.

Federal-State Planning Commission (e.g., Great Lakes Basin Commission)

State-Federal Compact (e.g., the Delaware River Basin Commission)

Interstate Compact (e.g., the Great Lakes Commission in the U.S.)

Binational Commission (e.g., International Joint Commission; Great Lakes Fishery Commission)

Water and Land Management Authority (e.g., Ontario Conservation Authorities)

Advisory Council or Group (e.g., U.S. National Research Council)

Regional Development Agency (e.g., Tennessee Valley Authority)

Permanent Research Agency (e.g., Canada Centre for Inland Waters)

Special Purpose University (e.g., University of Tromsoe in Norway specializing in the problems of the Arctic North)

Regional Government (e.g., Regional Municipalities in Ontario)

Unified Environmental Protection Agency (State/Provincial/ Federal)

Planning and Construction Agency (e.g., U.S. Army Corps of Engineers)

Single-Purpose Authority or Corporation (e.g., St. Lawrence Seaway Development Corporation)

Parliamentary or Congressional Group (e.g., Great Lakes Conference of Senators/Congressmen)

Global Environmental Data Collection Systems (U.N. proposed)

These various organizational forms and some combinations thereof were considered as to their suitability as models for an institutional arrangement for the management of the Great Lakes. The general consensus was that while these organizational forms seemed, on the whole, to be adequate for the specific purpose for which they were established and while some possessed advantageous features in the context of the resource management problems of the Basin, no one form or no single readily-apparent combination of them has the required scope and capability to provide integrated resource management of the Great Lakes Basin. This conclusion is in line with Lyle E. Craine's analysis of four different institutional forms considered as possible models for an improved institutional structure for the U.S. portion of the Great Lakes.[81] The Seminar was also in agreement with the observation made by Craine that the deficiencies identified were not necessarily "deficiencies in

the agency form itself but rather in the institutional system, or lack thereof, in which the agency has been expected to operate."[82]

Consequently, the idea of laying out the complete set of existing organizational forms and then either attempting to select the optimal one or constructing a composite institutional solution was abandoned.

A more abstract approach that was also considered early on was that of organizational criteria. Some writers have tackled the institutional problem with a methodology that includes devising sets of criteria with which existing organizations can be evaluated and as an aid to marking out the general characteristics of new organizational forms. In the Seminar's review of previous research in this field, it was evident that certain organizational criteria tended to appear repeatedly (although at times in different terminology) in the works of different investigators.

The Seminar identified those common criteria and then developed its own set of criteria - one that seemed appropriate in the Great Lakes context. While not claiming it had come up with the definitive set, the Seminar had confidence that the most essential criteria had been identified. These criteria are:

Jurisdiction

Enforcement Powers

Fiscal Adequacy

Staffing Adequacy

Administrative Discretion

Flexibility

Visibility

Accountability

Structural Compatability

Definitions of these criteria were developed and discussed. As an effective tool for suggesting the framework of an improved institutional apparatus, these criteria fell short. A discussion of them indicated that their utility depended greatly on too many factors. For example, it was difficult to apply the criterion of "enforcement powers" in a satisfying way to all three types of management functions (surveillance, mediation or control), because the degree of enforcement power required in these cases varies from very little to considerable. In addition, each resource management problem of the Basin requires its own level (and here again the range is wide) of enforcement power. Confronted with such practical difficulties, the Seminar dropped the idea of using organizational criteria.

The approach to the problem that was in most favor and was the one actually pursued consisted of the following steps: (1) identify the full set of resource management problems of the Basin; (2) ascertain the governmental function (surveillance, mediation or control) most appropriate for each management problem; (3) examine the public agencies in Canada and the United States established to carry out these functions and to cope with these management problems; and (4) determine what should be done that is not now being done.

Seminar participants felt that in going through these steps, the general features of a new organizational structure would be revealed.

In carrying through with this methodology, it was considered imperative that the existing constitutional, political, economic and cultural constraints operating within each country and between both countries be recognized and "factored in" whenever appropriate and to the extent the collective talents of the group allowed.

Resource Management Problems

In the identification of the resource management problems of the Basin, some preliminary work had been done on this by a graduate student group at Cornell University. These tentative results were made available to the Canada-United States University Seminar in the form of initial working papers.

The resource management problems of the Great Lakes Basin that were identified in the initial working papers and considered (and modified) by the Seminar included:

Water Quality
Municipal and Industrial Water Supply
Agricultural (irrigation) Water Supply
Lake Level Control
Hydropower
Flood Control
Navigation
Shoreline Protection and Development
Fish and Wildlife Protection
Water-Based Recreation
Solid Waste Disposal
Air Quality
Urban and Industrial Land Use
Agricultural Land Use
Land Transportation

The Seminar discussions served to help classify these resource management problems into those which: (1) are (or should be) matters of primary concern to a binational body and (2) require minimally:

-surveillance (e.g., information collection and reporting)

-mediation (e.g., development of joint programs; conflict resolution)

-control (e.g., regulatory responsibility and implementing authority).

The table on the next page helps to illustrate the two classifications of the management problems just mentioned.

The Current IJC Mandate

In the review and analysis of public agencies with responsibilities in the Great Lakes region, attention was focused on the International Joint Commission and, to a lesser extent, the U.S. Great Lakes Basin Commission. A summary of the analysis of the IJC has already been presented. However, in order to place the presentation that follows in better perspective, it will be helpful to review the present limits of Canada-United States arrangements as they are represented in the 1972 Agreement on Great Lakes Water Quality. Under the terms of that agreement, the following new responsibilities were assigned to the International Joint Commission:

1. Collection, Analysis and Dissemination of Data and Information on Great Lakes Water Quality
2. Advice and Recommendations to Governments on Boundary Water Pollution Matters
3. Coordination Assistance for Joint Activities Undertaken Pursuant to the Agreement
4. Coordination Assistance for Great Lakes Water Quality Research
5. Annual Reporting to Governments on Program Progress and Effectiveness
6. Discretionary Special Reports to Governments and Public on any Great Lakes Water Quality Problem

Table 1
Resource Management Problems Classification

Resource Management Problem	Level of Bi-national	Management Level* Surveillance	Mediation	Control
Water Quality	Primary	X	X	X
Municipal & Industrial Water Supply	Secondary	X		
Agricultural Water Supply	Secondary	X		
Lake Level Control**	Primary	X	X	X
Hydropower	Primary	X	X	X
Flood Control	Primary	X	X	X
Navigation	Primary	X	X	
Shoreline Protection & Development	Secondary	X		
Fish & Wildlife Protection	Primary	X	X	X
Water-Based Recreation	Secondary	X		
Solid Waste Disposal***	Secondary	X	X	
Air Quality	Primary	X	X	X
Urban & Industrial Land Use	Primary	X		
Agricultural Land Use	Secondary	X		
Land Transportation	Secondary	X		

*It is important to note that this classification arrangement was a part of the preliminary study in which problems clearly requiring a control program at some time in the future would be identified. The Seminar did not recommend the use of supra-national control authority by any joint Great Lakes management entity, except for water and air pollution control.

These classifications were developed as a means of organizing the information and data available to the Seminar. They provoked lively discussions and on some points there was wide divergence of opinion. They are presented here mainly to illustrate the process of review and discussion and are not to be taken as representing a full consensus of the Seminar.

**Lake level control is closely related to four other problem areas, namely: hydropower, flood control, navigation and shoreline protection and development.

***Shoreline and other dumpings by industry and municipalities.

7. Discretionary Authority to Publish Its Own Documentation Prepared in the Discharge of Its Functions Under the Agreement
8. Authority to Independently Verify Data and Information Submitted by Governments
9. Authority to Establish the Great Lakes Water Quality Board
10. Authority to Establish the Great Lakes Research Advisory Board
11. Authority to Establish a Regional Office and Other Subordinate Bodies

The new responsibilities placed on the IJC and the domestic agencies of both countries are significant and if the terms of the Agreement are actually implemented by both nations a big step will have been taken in controlling water pollution in the Great Lakes. While these modifications to the IJC mandate are indeed meaningful, important gaps still exist in these joint arrangements which limit binational effort. For example, the Commission still lacks initiatory authority and enforcement authority. It should be stressed also that the new responsibilities of the Commission pertain to only one aspect of resource management - water pollution.

General Specifications of a Revised Great Lakes Institutional Structure

Given that the 1972 Agreement does represent the extent to which the two countries are prepared to go towards institutional modifications at the present time, the Seminar nevertheless proposed further changes for consideration, in view of the rate at which real and potential problems are building up on and around the lakes.

As a result of Seminar discussions which were structured in the manner described up to this point, certain basic principles concerning an improved institutional arrangement emerged.

First, there was broad agreement that policy affecting the resources of the Basin can no longer afford to be made on a purely domestic basis with occasional provision for informal coordination between Canada and the United States. The Great Lakes are large and diverse but, perhaps most importantly, they are also binational and this fact requires that any proposed institutional system devised for improving the management of the Great Lakes Basin must be bilateral in character.

Second, and again there was no disagreement, given the complex interrelationships existing among resource management problems, this bilateral institutional arrangement must include the authority to deal effectively with the entire set of resource management problems in the Basin.

Third, an institutional arrangement implies the establishment of a bilateral organizational structure which would carry out certain policy, planning and management functions in the Basin as agreed upon by negotiation between the two federal governments. The way in which these three functions are defined and assigned is crucial and also controversial. It was at this point that opinions diverged.

Fourth, there was a general consensus that an improved institutional arrangement must in some way overcome the problem of incongruity between political jurisdiction boundaries and natural drainage boundaries. The Seminar's preferred approach to that problem was an institutional arrangement based on two separate but complementary organizational components. They are: (1)a joint Basin-wide policy and planning agency which is politically responsive primarily through federal, provincial/state and citizen representation; and (2) a network of regional or lake basin

management agencies responsible for implementing the appropriate surveillance and mediation tasks within the overall policy guidelines established by the Basin-wide policy agency. There was no sharp disagreement among Seminar participants on the general concept of a two-component institutional arrangement. There was, however, difference of opinion as to whether the emphasis should be placed on strengthened local or regional arrangements or, alternatively, on a centralized Basin-wide policy agency.

The institutional form proposed would be a joint (Canada-United States) body intended to serve as a common source of policy guidance and coordination for those public programs and private sector activities which affect, to an extent which would be agreed upon through bilateral negotiation, the water and related land and air environments of the Great Lakes Basin. In brief, it would have a supplemental, coordinative and catalytic role among the existing governments and their agencies.

It is important to emphasize that the joint body considered here is not a management entity in the sense of a regulatory and program agency like state, provincial or federal departments and agencies with legislative mandates. Neither is there any intention of altering the equality status between the two countries, or of creating a supra-national bureaucracy with authority over the existing three levels of government. Likewise, the organization need not displace any existing agency of any level of government having responsibilities for some aspect of resource management in the Great Lakes Basin.

The joint organization would carry out certain policy, planning and management functions delegated to it by the two national governments.

Policy and overall Basin-wide planning coordination with the governments of general jurisdiction and their respective agencies would be the province of the joint Great Lakes policy agency. Basin and regional planning as well as "management" duties would fall primarily (but not exclusively) within the sphere of activity of the regional resource management agencies.

The term "management" in the immediate context is defined as encompassing two general administrative functions, those of surveillance and mediation.

"Surveillance" is defined in this instance as information gathering, data interpretation and dissemination. It is a function concerned with problem identification and definition. It would require a continuing responsibility to be aware of current and developing problems in the whole Great Lakes Basin. It implies an active as opposed to passive search for relevant data and information. To properly carry out this function, an organization must possess an adequately equipped and staffed information system. This important and basic capability is the subject of a separate chapter.

"Mediation" is viewed as the administrative function going beyond that of surveillance in terms of authority and responsibility. It is an active role in which joint activities are agreed upon and conflicts are resolved through discussion and consultation. It is envisaged that the joint body being proposed would be actively involved in a coordinative and mediative capacity with the operating agencies in developing joint programs to attack common problems within the Basin. This role could include, among other things, promulgation (after appropriate coordination with the agencies concerned) of regulations, standards and compliance

schedules. While the joint body, under the definition and recommendations of this report, would have no enforcement authority of its own, such promulgations would provide clear evidence of acceptance of common goals and agreement on joint programs. The public notice of these actions would be a large step forward in securing public credibility, improving government accountability, and providing public reports for public assessment of progress.

While its initial basic administrative functions would be those of surveillance and mediation the two national governments may wish at some stage to consider vesting the joint agency with a specific enforcement role in the case of certain resource management problems, e.g., water pollution and air pollution.

As already stated, the joint agency could not carry out a truly effective mediation role under the present form of the 1909 Boundary Waters Treaty. Changes are required to allow the joint agency to operate (within carefully negotiated limits to be established by the two countries) without the restrictions that the reference procedure now imposes. The national reference requirements vitiate the anticipatory and initiatory actions that are essential to both planning and mediation.

The agency must have the flexibility needed to anticipate future problems of the Basin, to help plan for them and to assist in the co-ordination of programs designed to ameliorate them. The agency should have a planning staff adequate enough in size to provide it with expert advice on planning matters. Also, the agency must have sufficient fiscal and supervisory control over any planning activities itself undertakes or it sponsors.

This completes the discussion of the general specification of a Great Lakes management organization. The next section develops the viable institutional alternatives identified by the Seminar.

Institutional Alternatives

In developing the major characteristics of a binational body with the surveillance and mediation functions envisaged by the Seminar, two alternative approaches were identified and accepted by the group as a whole as representing the most viable options presently available. Both would require a considerable strengthening of cooperative relationships at local and regional levels to achieve the desirable degree of decentralized decision-making and public support.

The first alternative would seek to improve management of the resources of the Great Lakes by introducing organizational improvements within the framework of a significantly strengthened International Joint Commission. The second alternative would seek the same objective by establishing by treaty new organizational arrangements which would be distinct from the International Joint Commission. The Columbia River Treaty would provide a precedent in general terms but not in the specific details.

Alternative 1

The functions of the IJC would be significantly broadened with respect to the Great Lakes Basin. The scope of its jurisdiction over the water and the related land resources of the Basin would be extended commensurate with the new management functions assigned to it by negotiation between the United States and Canada. The IJC would be granted the necessary policy-making and administrative authority to enable it to carry

out its assigned coordinative role. The IJC would be freed from the present treaty constraint of acting only when a matter is referred to it by both countries, and it would assume an active role in the public decision-making processes through its mediation function. The number of commissioners as well as the present appointment criteria and procedures might require modification but this is left to the bilateral negotiations. The IJC would be authorized a binational, full-time secretariat that would carry out its functions at some mutually agreed upon permanent location in the Great Lakes Basin. The IJC would be authorized to establish subordinate offices at the basin or sub-basin level to the extent it deems appropriate. The relationship of the IJC to the court systems of both countries would be a major question to be included in the bilateral negotiations. The IJC should be empowered to hold hearings on all matters within its purview.

Concerning a planning role, the IJC would facilitate planning on a joint basis, using as guides the Great Lakes Basin Commission (GLBC) established pursuant to the U. S. Water Resources Planning Act of 1965[83] and the programs of coordinated planning carried out by arrangements between the Provinces and the Federal Government of Canada such as those possible under the Canada Water Act of 1970.[84] This means that the IJC would be authorized by treaty to serve as the principal agency for assuring the coordination of federal, state/provincial, interstate, local and nongovernmental plans for the development of water and related land resources within the Great Lakes Basin. Through its enhanced surveillance and mediation functions, it would also recommend long-range schedules of priorities for the collection and analysis of basic data and for

investigation, planning and construction of projects. It would carry out any other planning functions to which both national governments may agree.

One of the major functions of a strengthened IJC would be coordination of ongoing research and research planning pertaining to the Great Lakes Basin. This does not imply an in-house research capability for the IJC, however. The objective here is primarily to minimize duplication of research work and to identify gaps in the overall research effort.

Finally, the coordinative and catalytic role envisioned for the IJC implies a continuous and close relationship with the existing governments and their agencies having responsibilities in the Great Lakes Basin. It draws its political responsiveness from the fact that it would continue to be ultimately accountable to the Department of State and the Department of External Affairs. The provision for state/provincial and citizen representation would further ensure political responsiveness and accountability. Its authority would derive from treaty and this legal basis should be extended so that it is rooted ultimately in the laws of all the governments of general jurisdiction within the Great Lakes Basin.

Alternative 2

The second alternative differs from the first in that a specially created, international body supplants the IJC in the Great Lakes Basin. The IJC is relieved of its treaty responsibilities within the Basin and the functions of the existing permanent and temporary Great Lakes boards are absorbed by the new treaty-established body. The responsibility of the IJC for that portion of the international border lying outside the Great Lakes Basin would remain unaffected. The second alternative would

require the negotiation of a new treaty by Canada and the United States as well as modifications to the 1909 Treaty. The principal advantage of this second approach is that it gives policy-makers of both countries the opportunity to build "from the ground up" a joint agency specifically designed to improve the management of the water and related land resources of the Basin.

The functions of this newly created body would be, for this level of generalization, identical to those postulated in Alternative 1.

Strengthening the Base of Both Alternatives

To be fully effective, both alternatives above have to be based on strengthened cooperation among the array of Canadian and U.S. agencies having responsibilities in the Great Lakes Basin. Besides developing a binational policy body with surveillance and mediation functions, attention has also to be given to achieving more intensive regional (or sub-basin) collaboration in ways which put the binational body into an effective working relationship with the politically-responsive agencies at the municipal and state/provincial level.

One approach to this is to see that "opposite number" agencies at sub-basin and special problem-area levels within the Great Lakes Basin have and use wide authority to collaborate with one another in a trans-border manner in an array of management questions (while at the same time preserving clear-cut lines of political responsibility for policy-making in both countries). This is only to recognize that there is an inseparable relationship between planning for water management and pollution control, planning for community growth and renewal, and planning for the

future development of industry, agriculture and other resource uses within the Basin. This complexity has to be recognized and cannot be dealt with exclusively by strengthening centrally-created organizations such as the joint policy coordination body called for in the two alternatives above.

The concept of strengthened regional, local and counterpart agencies is based upon the following assumptions:

(a) That the critical points where intensive joint work is needed are within, as well as among, individual lake basins (e.g., Lake Ontario), in certain special problem regions (e.g., the St. Clair-Detroit River area) and at the level where existing or evolving research or monitoring agencies (such as the CCIW)* on both sides of the border can cooperate;

(b) That the stress (in "institutional organization") is on the existence of "opposite numbers" at basin and special problem-area levels - the opposite numbers being charged as far as possible with similar responsibilities, including a wide authority to collaborate with one another in a transborder manner;

(c) That, by thus stressing the intensive regional collaboration (in monitoring, research and program-making), the institutional arrangements will be consistent with the need for

(I) active and informed citizen involvement through existing municipal, provincial/state and federal political institutions;

(II) preserving clear-cut lines of political responsibility for policy-making in both countries;

(III) assuring a greatly enriched flow of knowledge from the regional to the central (provincial/state and federal) agencies.

Common Elements Shared by the Alternatives

In summary, the alternatives recommended imply or provide for:

- Establishing a joint Canadian-United States management body for the Great Lakes having surveillance and mediation functions;

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* Canadian Centre For Inland Waters: A unit of Canada's Federal Department of Environment

- Joint agency budget and administrative procedures;

- Initiatory authority for such matters as planning, surveys, investigations and research under carefully specified guidelines established by the two countries;

- Program responsiveness by requiring that the activities of the joint management body be subject to program and budget authorization and review on, for example, a biannual basis;

- Facilitating joint planning on a multiple purpose basis;

- Stressing intensive regional and transborder collaboration among state/provincial and local governments;

- Developing a more comprehensive and systematic approach to the management of the Great Lakes;

- Joint information collection and analysis; and

- Public reporting.

The alternatives recommended do not provide for:

- Changing the equality status of the two countries in matters concerning Great Lakes management;

- Establishing a supranational decision-making authority;

- Changing the basic authority of existing national, provincial, or state responsibilities; nor

- Necessarily displacing existing agencies.

Final Comments and Recommendations

These alternative approaches to institutional change were developed by the Canada-United States University Seminar in general terms only. The omission of detail was necessitated by time and other limitations but it was also partly deliberate. Too much detail would have tended to clutter the basic issues. It would have detracted from the important messages that the group wanted to impart. There exists a real problem of gaining sufficient acceptance on the part of governments and private sector groups in the conclusions of the Seminar to the point that significant

actions begin to take place. The Seminar participants were most concerned about the fundamental question that has to do with the general attitude of the Governments of Canada and of the United States on the multiple purpose management of the Great Lakes Basin. It is not clear whether or not the two Governments believe that the problems emerging in and around the Great Lakes are inexorably leading to critical situations and that it is imperative to initiate now concerted action in order to conserve and enhance these unique resources. There should be little doubt that the pollution problem is already critical. Can the two countries afford again to wait for other crises to occur as a prerequisite to action?

The major question is the willingness of both countries to exercise their political will at least to the extent of strengthening their ability to resolve existing difficulties and to be better prepared for future problems. Some members of the academic community of the region in both Canada and the United States have demonstrated their readiness to play a supportive role in this endeavor.

The specific recommendations of the Canada-United States University Seminar were as follows:

1. The Governments of the United States and Canada should initiate, on a joint basis, a comprehensive examination of the problems associated with multiple purpose management of the Great Lakes in order to conserve, develop and use that unique resource for the mutual benefit of the people of both countries.

2. The alternative proposals formulated by the Canada-United States University Seminar should be used by the two Governments as a basis for initiating discussion and debate on the modernization of the management of the Great Lakes.

3. In the United States, a study bill should be introduced early in the 93rd Congress for the purpose of opening the doors to serious public debate on the question of the joint management of the Great Lakes Basin by local, state, regional and federal officials and private persons and nongovernmental organizations concerned with the public interest.

4. In Canada, the findings of the Seminar should be discussed with officials in the federal government, the Ontario provincial government, and selected regional and local governments in Ontario. The purpose would be to encourage informal federal-provincial-regional-local consultations on the new steps and responsibilities needed for the Great Lakes Basin, with a view to developing more detailed proposals for consideration at the Cabinet level of the two senior governments and providing material for bilateral consultations.

In the succeeding Chapter IV, a report is made on actions that have been taken in various ways to maintain and extend a public discussion on improving Great Lakes management.

CHAPTER IV

INITIATIVES FOR ACTION

The objective of this Reader and the reports on which it is based, as stated earlier, is to encourage and stimulate public debate on ways to improve the management of the Great Lakes. Changes in public policy are occasionally brought about by the publication of reports proposing new ideas. More frequently, however, change is brought about by a purposeful effort to transmit ideas to the public so as to develop a broad base of general awareness as well as to special groups capable of actions leading to adjustments in public policies. This chapter describes some of the public actions that have been taken and which are partly or wholly attributable to such a purposeful effort, a part of the Great Lakes project design.

A series of activities were carried out during the research program and the period in which the Seminar Report was prepared in support of action leading to policy change. In the summer of 1971 a draft report on A Proposal to Improve the Management of the Great Lakes was distributed to the Governors and Provincial Ministers Conference, sponsored by the Great Lakes Basin Commission, and held at Mackinac Island, Michigan. The Commission had, as one of its responsibilities, the task of recommending institutional changes for managing the Great Lakes as part of its Great Lakes Basin planning program. It had contracted with a consultant to study this matter, and the Commission believed that the draft report made an additional contribution to the presentation of alternative management ideas.

At the outset of the development of the Canada-United States University Seminar, it was unanimously agreed that the Seminar would be a completely open affair. As a result, representatives of federal, provincial and state governments were invited, and attended, to the first Seminar planning meeting and subsequent Seminar activities. Strongest participants in this collaborative effort were staff representatives of the International Joint Commission. The sole exception to this policy concerned the endorsement of the final Seminar Report and, for obvious reasons, government representatives were not requested to participate in this formal action.

In August 1972 the draft Seminar Report was presented to the Commissioners of the Great Lakes Basin Commission at a meeting at the Thousand Islands, New York. Subsequently, in March 1973 the Seminar Report was published and was given wide distribution in the United States Great Lakes region and in Canada.

The winter and early spring of 1973 saw a resurgence of high water levels in the Great Lakes. Damages were augmented by storms which caused destruction to shore properties. In response to demands by concerned citizens and their representatives in Congress, a number of committees in the Congress held hearings about the causes, effects and possible remedies of Great Lakes high water levels. Initially, since one of the recommendations of the Canada-United States University Seminar proposed the early introduction of a study bill in the Congress to allow for exploration of new Great Lakes management opportunities, it seemed desirable to attempt to present the Seminar

findings to one of the appropriate committees. As the testimony in the several committees unfolded, it became clear that the members of Congress were concerned equally with the immediate problem of lake levels and with arrangements for managing the Great Lakes.

To explore the degree of interest that appeared to be present one of the authors (Dworsky) arranged for appointments to be made with members of Congress who either had testified before one of the congressional committees or who had been interviewed by the press. In one day during early April 1973, discussions were held with the following members of Congress or their staffs: Representative Conable (N.Y.). Representative O'Hara (Michigan), Representative Mosher (Ohio), and Representative Vanik (Ohio). The day's conferences concluded with a meeting with Representative Dante B. Fascell, Chairman, Subcommittee on Inter-American Affairs, House Committee on Foreign Affairs, and his staff director Michael Finley. Following a description of the Seminar report, the Seminar participants, and the positive reaction received from all the offices visited during the day, Chairman Fascell indicated his desire to have the seminar co-chairmen (Dworsky - Francis) present the report, its findings and recommendations to the Subcommittee at a special hearing to be called for that purpose.

Testimony Before The House of Representatives Foreign Affairs Committee

The hearing was held Tuesday, May 1, 1973 under the subject THE GREAT LAKES - The 1973 Floods and Activities of the International Joint Commission, United States and Canada. Highlights of the hearing are presented to provide some insight into the committee process, the views of members of Congress, and the character of the responses by the Seminar Co-chairmen.

The subcommittee met at 10 a.m. in room 2255, Rayburn House Office Building, Hon. Dante B. Fascell (chairman of the subcommittee) presiding.

Mr. Fascell. "The subcommittee will come to order.

Today the Inter-American Affairs Subcommittee meets for the third time to hear testimony on U.S. participation in the International Joint Commission, United States and Canada, and the problems of the Great Lakes, an area which by the end of this century is expected to include a third of Canada's population and a quarter of our own.

This morning we are expanding our inquiry beyond the scope of existing institutions and immediate problems to examine alternative methods for more effectively dealing with Great Lakes' issues in the future. To help guide us in this important undertaking we are fortunate, indeed, to be able to draw on a recently completed report of the Canada-United States University Seminar entitled 'A Proposal for Improving the Management of the Great Lakes of the United States and Canada.'

The report was prepared by a distinguished group of United States and Canadian scholars under a grant from the U.S. Department of the Interior. It offers a specific set of guidelines for the improvement of public policy and is, in my opinion, exactly the kind of analytical, practical and useful report, the Congress had in mind when it passed the 1964 Water Resources Research Act which established the program that made this report possible.

To review the entire report with us, and particularly its specific recommendations, we are pleased to have with us the two very able co-chairmen of the Canada-United States University Seminar which produced this excellent report: Dr. Leonard B. Dworsky, professor of civil engineering and director, Cornell University Water Resources and Marine Sciences Center; and Dr. George R. Francis, professor and chairman of the Department of Man-Environment Studies, University of Waterloo.

I understand that our colleague, Congressman Howard W. Robison, would like to briefly introduce our witnesses. He has the floor to make some comments, and we are delighted to see him here and to have him participate in these hearings with us."

Mr. Robison. "Mr. Chairman, I am privileged to present to you one of my congressional district's major contributors to Federal water management policy. Leonard Dworsky, Director of the Cornell University Water Resources and Marine Sciences Center, has provided me with invaluable counsel and assistance as he has several other Members of Congress - on many occasions. His academic proficiency and his experience in government have combined to make him a rarity among his colleagues, for he is a highly esteemed expert in his field who can translate his academic products into workable public policy.

Among his many contributions, Professor Dworsky helped me draft the 'Safe Drinking Water Act,' which now appears headed for passage by this Congress. He also contributed to the draft of the 'Water Quality Act,' which we passed last year; and, as you gentlemen know, he has participated, along with Prof. George Francis, who is also here today, in focusing the talents and resources of the Great Lakes universities in the United States and Canada on the prospects for better joint management of the Great Lakes.

Because of the geographic and hydrological proximity of my congressional district to the Great Lakes, my constituents and I must pay close attention to those huge bodies of water above us. The problems of Great lakes water levels and pollution can carry their impact to my part of 'up-State' New York, so I have tried to be attentive to any initiative which proposes to lend the best available scientific and management skills to the Great Lakes. For this reason I participated in a 1965 position paper with several other House Members who jointly called for expanded emphasis on the management and mediation potentials of the International Joint Commission.

That statement was destined only for dusty Congressional Record archives. But, perhaps with the fresh infusion of the talents of these gentlemen before you, and the many universities they represent - the members of this committee can meet the now pressing necessity for joint management of the Great Lakes and move the Congress and the Federal Government to some new thinking on Canadian-United States cooperation in solving Great Lakes problems.

Mr. Chairman, I have to attend my own subcommittee duties this morning, but it is a pleasure to have been here and to leave these two gentlemen in your capable and interested hands. Thank you very much.

Mr. Fascell. Congressman Robison, thank you for the introductory remarks, and also for your reference to the 1965 statement, one of the principal signers of which just entered the room.

Mr. Robison. Yes, I remember very well Mr. Frelinghuysen's interest and contributions.

Mr. Fascell. He has along with you continued his interest in this very important problem. It does affect all of us, and so we consider it quite vital too.

Mr. Robison. Thank you very much for this opportunity.

Mr. Fascell. Thank you very much."

* * *

"Mr. Fascell. You may proceed."

Dr. Dworsky. "Both George and I have been deeply involved in resource management problems and we have had a good deal of experience in working with both Government and the universities. I suspect that the reason Congressman Robison mentioned that we have been modestly effective has been because we think we understand some of the needs of the Congress on our side, the Parliament in Canada on George's side, and try to translate science and technology into practical and useful terms."

* * *

Dr. Dworsky. "I would also like to introduce two people who are in the audience. One is Mr. Charles Swezey, our senior research associate and executive secretary of our seminar. And then we have our seminar consultant with us; a long term career man in Government and a former Associate Director of the Office of Water Resources Research, Mr. Eugene Eaton.

It strikes me, Mr. Chairman, that this may well be the first committee hearing addressed specifically to the question of the management of the Great Lakes and the organization for that management since, I believe, the Boundary Water Treaty of 1909. I don't recall at the moment any reference to a hearing that was specifically addressed to this question. There had been questions about specific problems like high water levels in the Great Lakes, or the low water levels in

1964, and so on, but never specifically to the question of how we are to manage the Great Lakes. I want to compliment you and members of the committee for bringing this matter forward.

This statement deals with management of one such international problem, the Great Lakes of North America and the boundary waters between the United States and Canada. The objective of the statement and of the report it represents is to change the current management of the Great Lakes in order to make it more effective to meet not only some of the current problems, but rather to be prepared to meet the emerging future problems.

A second objective is to make visible one inquiry into an international water and land resources problem with the hope that such an exposition will provide a useful guide to assist in either resolving or strengthening other international water and land management questions...

* * *

Essentially, what we are saying, Mr. Chairman, is that we have been dealing with a series of situations on the Great Lakes in a separable fashion. At one time, for example, we are concerned with low water levels. The journal report I have contains an article by Mr. Ben de Cook of the Corps of Engineers, and it illustrates our problem. The first paragraph of his article says this:

> During the past few years Great Lakes waters have dropped to record low levels. This has drawn much public attention and created many problems. Fifteen years ago there was concern over extremely high levels of these waters.

This report was written in June 1967. Today we are dealing with high water problems; at other times, we are dealing with the low water question.

This question, and other questions, are maintained all of the time. Sometimes we deal with water pollution. At other times we deal with the question of navigation, separately again. And fisheries have been dealt with in an international convention separate from the I.J.C.

So we have dealt with these questions separately over time, and we believe that the institutional - the governmental organization - problem we are facing today is a reflection

of the fact that what we have has simply grown, like Topsy, over time, and this is what the countries have had to work with. There has rarely, perhaps never, been an opportunity to ask ourselves how to deal with the matter of managing the Great Lakes in an integrated way? Certainly, by now we should be well aware of the fact that the problems are linked together. We believe that the problem of the lakes and the land around it must be dealt with in a much greater coordinated fashion.

So this is our major thrust today. What we are aiming at is an attempt to see if we can define the question of how the lakes have to be and how they ought to be managed in order to provide some answers to these constantly reoccurring questions.

We believe that in our view, Canada and the United States must act now individually and jointly to remove the obstacles to institutional enhancement, to improvement of management arrangements for the Great Lakes if these unique resources are to be preserved and enhanced for future generations.

Let me skip now, Mr. Chairman, to where I think our entire statement will lead us. If you don't mind, using the statement we have, will you please turn to page 48. This is our proposed action item, and I think we might take a look at it.

This proposal, at the end of our statement, is our recommendation for action by this committee, and a recommendation of course, to the full Foreign Affairs Committee and, ultimately, to the House.

We believe that a resolution ought to be prepared and enacted by Congress that would say: The Congress of the United States is deeply concerned about the need to strengthen the management of the International Great Lakes in order to conserve, develop, and use that unique resource for the benefit of its citizens. The Congress believes that this concern is shared equally by the Government of Canada. The Congress, accordingly, requests the President to initiate new discussions with the Government of Canada with the objective of: (1) Developing a joint comprehensive examination of the problems associated with the multipurpose management of the Great Lakes and associated lands; and (2) using this examination to determine ways to strengthen significantly the joint multipurpose management of the Great Lakes. Among other opportunities, the alternative proposals formulated by the Canada-United States University Seminar should be used as a basis for initiating such discussions.

Now, keeping that proposal in mind, Mr. Chairman, I would like to turn to the section that begins with page 34 and which has to do with study conclusions and recommendations.

I might say, since Mr. Frelinghuysen came in moments after we started and didn't hear Mr. Robison's opening remarks, I wanted to say specifically to him that the statement he and other members of the committee prepared back in 1965, and reported in the Congressional Record of September 28, was a great stimulus to our interest in developing these studies, and for the last 6 or 7 years we have been pursuing this in one way or another. A good many of the recommendations that were brought out at that time are still important recommendations today. I think you will find our report recommendations consistent in many ways with what you and your colleagues had said then. Your report, by the way, included Mr. Gross, I believe, and other members of this subcommittee.

We also believe that these recommendations are consistent with the Principles for Partnership, as developed by Ambassador Merchant and Ambassador Heeney in their statement concerning Canada and U.S. relations, published in 1965.

So these are not essentially new items. In effect, we are trying again in 1973 to focus our attention to these questions of Great Lakes management.

* * *

We propose two alternative organizational possibilities. Our study group, made up of very good people, law, public administration, science, planning, geography, environment, and others, were keen on the idea that the International Joint Commission had a fine record as far as it has gone based upon the authority that has been granted by the two countries. Rather than strive anew for a development that would take us perhaps into unknown areas, the suggestion that we have made to you in this report is that perhaps we might look first at an alternative to strengthening measurably the International Joint Commission.

It certainly has been a body that stands out far above any other international body in the world in terms of managing boundary water problems over a period of 60 years or more, and that has kept the relationship between Canada and the United States on an even keel. So we think it important to look at this body significantly as the body that could manage a new set of affairs.

On the other hand, as a second alternative, we suggest that if that is not deemed to be the proper way to go, then we suggest that we may want to follow the pattern that has been established, for example, in the Columbia River Basin. That pattern refers to a new treaty under which the countries will establish a new organization, probably negotiated by IJC as they have done it in Canada or otherwise as the President may determine. Such a body to provide the kind of effort we are suggesting to you in respect to the Great Lakes. Such a new organization, of course, will relieve the IJC of day-to-day operations vis-a-vis the Great Lakes, as it did in the Columbia. The IJC would still have over 2,000 miles of boundary to be concerned about.

Therefore, we can strengthen the IJC or we may have a separate organization by treaty. Either one will require negotiations by the two Governments. This is why our resolution suggest that the President open discussions with Canada for a fresh look at the situation.

These alternatives carry us to the end of our presentation, Mr. Chairman. They make recommendations with respect to alternative arrangements to strengthen the management of the Great Lakes. Pages 44 and 45 summarize the alternatives we would like to have instituted for a management agency.

We believe we have carried our work as far as we can as independent examiners and analysts of the question. Today we are laying this matter before the Congress of the United States. Professor Francis hopes that he and his colleagues will have the opportunity to lay this question before appropriate bodies in Canada. We both hope it to be a stimulant, in the best possible way, to open the discussions of how these vital, unique, world-renowned resources of the Great Lakes can be saved for the future.

Thank you for this opportunity."

Mr. Fascell. "Thank you, Dr. Dworsky, for that hasty overview of years of work." "Dr. Francis"

Dr. Francis. "Thank you very much, Mr. Chairman.

First of all let me say it is a pleasure for me to be with you this morning. I think it was 2 years ago that I had occasion to visit Cornell and found out some of the things they were doing. At that time they were looking at the various problems of Lake Ontario, what some of the

programs are to resolve difficulties and, more particularly, what the future seemed to hold when looking at trends and projections.

They at that time suggested it would be helpful if we took some of their concerns and interpretations of what was happening before a rather larger audience in both Canada and the United States. I agreed this was a good idea, and helped organize the Canadian participation of this particular seminar.

I might add that when I was lining up people both at the universities and from our Federal and provincial government agencies to participate in these meetings, I got nothing but a warm response at the suggestion we get together and talk over these issues. I think this is rather important because I must admit I was expecting there would be a bit of reticence like: 'Why do you people want to get involved? We have certain programs under way and we already have cooperation, and what else needs to be done?'

There was none of that. There was a general feeling that this was a very timely thing to do. I think as a result we got very active participation from people at the universities in Ontario who attended the seminars and people who came from our Federal Government agencies and some of our provincial government agencies who attended as participant observers in these sessions.

We hosted two of the main meetings. These general conclusions which have been reviewed for you do represent the result of many hours of very intense, interested and informed discussion among people from both Canada and the United States.

We were mindful certainly of the work which has already been carried out, particularly in the area of biophysical research on the Great Lakes exemplified by the International Field Year on the Great Lakes. We are also very much aware of the work and accomplishment of the International Joint Commission. We thought so far so good, but where do we go from here?

This is what caught everybody's interest. We are looking on our side at some of the projections that have been made with regard to increases in population, increases in urbanization, and increases in industrial development, particularly in the lower Great Lakes in Ontario. We can see the possibility of continuing problems and difficulties which have to be resolved.

I think this is what raised the level of interest among participants from the Canadian side. We should be finding some way to provide a more continuing watching brief on these situations to be aware of them before they generate crises and also try to look at them in a broader perspective of how they relate one to the other. I think this represents the main feeling of the Canadian participants in this seminar with the result that they have taken a major hand in arriving at some of the conclusions which Len has summarized for you. I know they are looking forward to getting copies of the report which was produced last week. We are looking forward now to seeing where we go from here."

Mr. Fascell. "Thank you, Dr. Francis.

It is obvious to me that this report is not only timely, but represents a very important basis for some action. The makeup of it is unusual and I am impressed by the enthusiasm of both of you in the presentation of the matter which might be termed rather sticky, esoteric or whatever. But its importance is so obvious. This is an important work. The subcommittee is delighted to be a forum at this particular time to help this along, and to review the matter, and to take whatever action the subcommittee thinks is appropriate.

I must say you gentlemen were very thorough. It has been a long time since we have been presented with language for a possible resolution. It makes our work easier to know exactly what it is you are shooting for.

I have a few questions that are troubling me. I am trying to get fixed in my mind, and I know it is in a pamphlet somewhere, because there is a pamphlet on everything, an overview of the broad organizational structures, both national and State. Does the same kind of thing exist on the Canadian side?"

Dr. Francis. "I think it safe to say the main responsibilities affecting many of the questions of the Great Lakes area under the Canadian constitution lie with the provinces, and perhaps we have a somewhat simplified situation in that fortunately only one province is involved with the Great Lakes, Ontario, so that much of the responsibility on a day-to-day basis lies with provincial agencies. But there is a Federal involvement because it is an international body of water, and there are other responsibilities that the Federal Government has. So in terms of cooperative work at the Government level, it gets carried out through Federal-Provincial agreements. These can be very informal, based on particular programs or particular projects.

Or if need be, if you are looking at the Great Lakes Basin as a region, it could perhaps be done under the Canada Water Act of 1970. I don't think we are talking about that at the moment, but this is an act that does provide for comprehensive joint Federal-Provincial planning for water resources in Canada, and it has been used in other parts of the country. So the legislative apparatus is there for that kind of co-operation."/

Dr. Dworsky. "I would like to add, Mr. Chairman, in addition to the States, Provinces, and two Federal Governments, the International Joint Commission has established 13 joint boards, in addition to the recent water pollution boards, between Canada and the United States, for example, for regulation of Lake Superior, for the regulation of Lake Ontario through the St. Lawrence control structures, and for other operations.

Mr. Fascell. IJC sits on top of these as the administrative agency having the responsibility for implementation after agreement has been reached. It then delegates an agreed-on plan to the operating subunits.

Dr. Dworsky. This is essentially so. First of all, it must start from references by the two countries giving IJC authority to deal with these areas. Then IJC make examinations, and in doing that they bring together parties from both countries as study groups. Then they make recommendations to the countries and, if these are accepted, set up surveillance and/or operating or control boards.

Mr. Fascell. What has been the history of initiatory actions outside the IJC? Have they been in the nature of separate problems or separate institutions which have initiated agreements, which would then refer them to the governments, and which were then referred to the IJC?

Dr. Dworsky. Yes. I think the main specification of the past has been the lack of cohesive initiatory authority on the part of the agencies concerned with day-to-day operation of these problems. They have had to wait until the countries decided mutually that there was an issue, and then the technology of the engineers and social scientists who deal with day-to-day government on both sides could begin to deal with the problem.

Mr. Fascell. In other words, not only has the problem been fragmented but the initiatory action has been fragmented?

Dr. Dworsky. That is right. Of course, not only in IJC through two country references, but in addition through the

eight States in the Basin, the regional governments that are concerned like the Great Lakes Compact Commission, which is separate from the Great Lakes Basin Commission, and from the government of the Province of Ontario with its several ministries as well as Canadian Federal Government interests.

Mr. Fascell. What do we do with all of these boards, agencies and commissions in terms of what is being proposed here? Does anything happen to them?

Dr. Dworsky. Yes, we would suggest, this goes perhaps beyond the specifics of what we had intended to get into today, but speaking for myself———

Mr. Fascell. I don't want to create any adversary opposition before it appears on the horizon.

Dr. Dworsky. I guess I was making this comment so you would understand my comment here would just be my comment.

I think that in the joint agency that we are talking about as we view it, these boards could be built into that operation so that they could continue to exist. The specifications of any new charter would be dependent upon negotiations between the two countries as to how they want to establish and give tasks to a new management agency. Over a period of time, say 3 to 5 years, these boards, could be built into the structure of a joint management agency. The major point I wish to make is that in a joint management agency we would have a chance to begin to relate the separate functions and agencies into some kind of a useful and reasonable management organization of the kind we have proposed.

Mr. Fascell. It seems logical to me as a layman that that would be the case. I suppose anything that would not be a management authority as a subunit for the IJC, or whatever new agency is created, would eventually wither away or, being extraneous, probably not be funded.

Dr. Dworsky. Things seem to hang on.

Dr. Francis. That is why the seminar came to the conclusion that, whatever else, we really ought to start with the whole question of surveillance and try to get an overview of what is going on and what is happening, and what is building up in and around the lakes.

Mr. Fascell. That sounds like a sensible middle course; not advocating a supranational organization for the abolition of everything that now exists, which would not be very practical in terms of getting anything done.

Dr. Dworsky. We thought we would be wasting your time, and we would have wasted our time certainly.

Mr. Fascell. Yes certainly.

Regarding the question of still another treaty, can't we hang on to what we have and move forward and do what has to be done in terms of initiatory action without having to negotiate another treaty which may take us another 6 years.

Dr. Dworsky. This would rely on our first alternative, to strengthen the existing International Joint Commission. If the two countries by negotiation could extend the broad language that now exists in the Boundary Water Treaty and provide the flexible framework which would allow them to have initiatory powers, and other desired functions spelled out in our report, this would appear to be a proper way to proceed.

Mr. Fascell. Am I correct in assuming that if time is of the essence and if we want to get away from a crisis-to-crisis operation, that we better take the quickest route?

Dr. Dworsky. I would think so. I would be happy to see reasonable forward motion that would allow us to test a new arrangement.

Mr. Fascell. Dr. Francis, what is your reaction?

Dr. Francis. That was a point we discussed among ourselves, and there was a feeling that in the short run building on what has been accomplished is the most sensible thing to do. However, there was the question that if we start to expand the range of cooperation in the Great Lakes, this goes far beyond the existing International Joint Commission. And keeping in mind the Commission has responsibility for other transborder problems across the country, maybe the question here becomes one of the tail wagging the dog, so possibly at some stage it would be better to look at this other alternative organization yet build into it all of the available experience. Maybe this would be a viable alternative to talk about since there is a precedent of sorts in the Columbia River Treaty.

Dr. Dworsky. One could visualize a blend of things you are suggesting, Mr. Chairman. In the immediate future, right now, to get on with the work by bringing together the presently separate functions. I think Mr. Herter indicated that when he appeared before you, according to my notes from newspaper clippings. I thought he indicated that he has rather wide authorities now, but they were separable and he might be able to bundle them up to start a new management arrangement. Maybe in the next year we can do that while we pursue other objectives in the longer term; of observing and seeing what we need to do to strengthen the process under a new treaty.

It is here that the President's initiative is so great, much depends on how he and the State Department and IJC themselves feel about this.

The point Mr. Francis makes I would like to emphasize. That is, we, too, recognize we have an agency that has 60 years of experience, but you know that institutions develop their own characteristics, their own psychology, and their own rules of action. The question here is whether or not the break with the past can take place sharply enough so that in fact IJC can be given these new responsibilities and can act. I am not prepared to say they will or will not.

I am asking questions about how they may behave in order to consider what future actions may look like. They may do beautifully, and the IJC is composed of highly skilled people.

Mr. Fascell. Mr. Steele.

Mr. Steele. Thank you, Mr. Chairman.

Gentlemen, I want to add my compliments on the very important work that has come out of the seminar. I am extremely interested in your suggestions for building on what we now have, but I would like to ask for a brief summary of precisely what we do now have in terms not of organization, but in terms of effective action.

For example, I was very interested in your relation of what has happened in terms of joint pollution control efforts for the Great Lakes. We started in 1906, you said, to recognize the problem, but it was 1964 before we started to take any concrete action on it. What kind of concrete action are we taking now? How would you evaluate and assess and describe how effective joint action has been on the problem of pollution of the Great Lakes at the present time?

Dr. Dworsky. The Great Lakes Water Quality Agreement is probably as good a technical document as you can find. I think it has sound objectives and it has been well developed. The people who did it are some of the world's best. The question about whether the agreement will be effective is going to be answered in terms of Government, not in terms of science and technology. The scientists and technologists pretty much know what they need to do.

Whether or not this organization is going to be effective has to be tested. Our report states that we will have to observe during the next couple of years to see whether it is going to be effective. Effectiveness is going to depend on the appropriations committee that handles State Department appropriations, in terms of how much money will be provided the U.S. side for operations.

Effectiveness will depend on how much money the Congress and the President will agree upon for construction of water pollution control facilities. Effectiveness will be determined on the basis of whether or not the States agree to Mr. Ruckelshaus' statement that he made within the last 2 weeks with respect to asking the States, not demanding but asking the States to allocate relatively more moneys to the Great Lakes in order to meet the commitment that the U.S. Government has made with Canada for the construction of waste treatment works.*

* * *

Dr. Francis. We do not have quite the same problem deciding the relative importance of the Great Lakes. They are very important to us, and become increasingly so in terms of projected urban concentrations, so there will be emphasis on the Great Lakes. As I understand it, there have been arrangements worked out with our Federal agencies to accelerate the construction of treatment plants in order to meet some of the technical objectives.

There has been some concern expressed in the Canadian press in recent months as to whether or not the anticipated schedule of the executive agreement can be reached because of these funding difficulties which have occurred in the United States.

I do not know the details, but this is one of the things they will want to watch to see if that particular agreement can be carried out more or less on schedule. If it can, and we all hope that it will and expect ultimately that it will, this would be a good precedent for building up and expanding cooperation in these other areas.

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*See page 111 for reference to a report concerning this matter in Globe and Mail, Toronto, December 22, 1973.

Mr. Steele. Let's take a concrete example. We have been reading for over a decade that Lake Erie is a dead lake. We were talking about this problem back in 1906, according to your testimony. Have we made any progress in dealing with the Lake Erie problem, or is it where it was several years ago?

Dr. Dworsky. I think we are making progress, Mr. Steele. Whether we are going to make progress rapidly enough to overcome the growth that is continually taking place on the lake is also a question.

Mr. Steele. What kind of progress have we made?

Dr. Dworsky. I think, for example, at Erie, Pa., the State is getting to the point of cleaning up some of the problems of papermill wastes and the problems of waste discharges from the city.

In Cleveland, they have developed a stronger program over the last few years. They have been hung up on the basis of money. The Federal Government's contributions have been available, but Cleveland is moving ahead. Detroit is moving ahead, but at the same time, many of us believe that the rate of progress is simply not enough.

I do not believe that the rate of progress is enough to keep us ahead of the game based upon not only what we have to overcome, but also in order to take care of the new developments that take place.

* * *

Mr. Fascell. Yes. What do we do with Lake Michigan? It looks like an appendix hanging down there. Can it really be excluded from consideration?

Dr. Dworsky. Geographically and topographically, it cannot be separated. The question is political. The question is whether or not the two countries will be able to manage a negotiation whereby the effect of Lake Michigan on the balance of the lakes, and vice versa, will be properly brought into focus.

This is a political question for the countries, and my view would be that I hope in every possible way, through negotiations, that these efforts on Lake Michigan and the other lakes would be brought together as a system. They cannot be separated.

Mr. Fascell. It is a primary responsibility on the U.S. side to reach an agreement with the States involved?

Dr. Dworsky. I cannot answer that precisely. I think it is really a matter of the U.S. Government. They have sole responsibility for the lake, certainly from the standpoint of navigable waters law.

Mr. Fascell. Is there a different context internationally with respect to the legal definition of Lake Michigan?

Dr. Dworsky. No, I guess this is historic. It is not a boundary water. The boundary does not encompass Lake Michigan.

Mr. Fascell. As a nonboundary water and accepted as such by Canada it is all navigable water.

Dr. Dworsky. But, on the other hand, the commerce from Chicago has been concerned with all of the lakes.

Mr. Fascell. So, it seems to me that the question of Lake Michigan is a matter of fundamental concern.

Dr. Dworsky. Yes, sir. I think this is right.

Mr. Fascell. I am still struggling a little bit with the overall structure. I suppose the reason I am struggling is because I cannot visualize all of it right now in terms of operations with the IJC. It has total boundary responsibility. I suppose the only way to get a handle on that would be to do what you are suggesting, which is an overview of the entire matter to determine both the structures and the responsibility. I am talking about a basic understanding of the organizational structure and responsibilities which is basic to making fundamental decisions.

Dr. Dworsky. I would like to comment on that, if you do not mind, with reference to this additional set of reports.

Mr. Fascell. This is a compilation of all of the organizations having to do with the Great Lakes, these six volumes?

Dr. Dworsky. No, sir. Let me tell you what we have done here as a futher venture beyond the report we have been describing.

In a graduate program I direct at Cornell, we had a choice, having completed our report and having made suggestions for alternatives, either to wait for government to do something or to test the proposed organization ourselves. So, we said, "Let's test it out ourselves."

Mr. Fascell. Why wait?

Dr. Dworsky. We wanted to show, for example, that the proposals we were talking about were practical, amenable to existing information, and could be accomplished. What we designed this last year in my particular program was an investigation with some 10 graduate students, of specific details about how a Great Lakes arrangement would be implemented.

The series of reports I have just submitted to you are the results of their effort. This one by Mr. James Burkholder on Natural Resources Management of the Great Lakes, is a report which deals with the question of a transitional organizational arrangement, which is the very question you were inquiring about.

We recognized the organizations that now exist. We developed an outline with respect to what a transitional period might be. We tried, with reasonable success to address that question in this document. This was done primarily in one semester. If we can do this in a university in 15 weeks, I suspect that government, with their staff and competency, can equally undertake this kind of a task.

The next subject we looked at was an information program on the Great Lakes. Rather than developing an information program, we looked at the information itself. This report by Mr. Dale Reynolds deals specifically with the sources of information in Canada and the United States, the materials that are available from official agencies and suggests some specifications for an information program.

The next report concerns public participation in the management of water and land resources by Mr. Arvid Thomson. Another report by Mr. Lawrence Saunders is about the problem of development of the Great Lakes, and while this is more of a general report, it addresses itself to what kind of population strategies should the nations be concerned with; new towns, restrictions in growth; population, transfer of population; and the like.

We also examined the boundary situations between Canada and the United States at Niagara Falls. There are comparable situations between Detroit and Windsor and at St. Mary's in the Lake Superior area.

This case study by Mr. Donald Kisicki considers how those two boundary Governments might cooperate in the absence of a specific treaty, for example, and how we could get improvements in a regional situation. Finally, we have one dealing with cost sharing on water pollution.

This set of studies, which I provide to the committee for its files, shows that the development of additional information to determine the specific nature of a new management arrangement to be a practical task.

It is not something that we need to put off into the far future. We are saying to those interested, "Look, we did it." These reports, of course, are not complete, perhaps they represent an effort that provides merely a start. A lot more refinement is needed, but I think we are saying to you that it is a practical task and let's go to it.

Mr. Fascell. Yes. Both of you continue to amaze me, because now we have an administrative blueprint as well as a legislative blueprint. That is very unusual.

* * *

Mr. Fascell. Your original study, as I recall, it was based on problems for two lakes. Is there any problem in expanding this in any sense as far as making it applicable to all of the lakes?

Dr. Francis. We thought not, Mr. Chairman. We thought the basic operating principles could be developed on the two lower lakes. While their problems are more intense they could provide a basis for extrapolating approaches to other lakes as may be necessary. In principle, I think it should be the same.

* * *

Mr. Fascell. What about the concept in the interim report that the only solution to the water level problem to the Great Lakes is to move the people away?

Dr. Dworsky. George, do you want to talk about that?

Mr. Fascell. Are the Canadians prepared to resettle Montreal, for example?

Dr. Francis. No sir; but it raises the question of shoreline planning, a kind of coastal zone that has to be looked at. There is some planning going on in the western end of Lake Ontario where it is proposed to move the shoreline out into the lake a little to provide waterfront parks and open space.

Mr. Fascell. You mean bulkhead out into the lake and fill it in?

Dr. Francis. For open space.

Mr. Fascell. We have been doing that in Florida for years and all of a sudden it has caught up with us, and we cannot do that any more. It is not environmentally sound.

* * *

Mr. Fascell. Does the IJC or another organization now carry on any comprehensive planning?

Dr. Dworsky. The comprehensive planning task on the Great Lakes from the U.S. side is a responsibility of the Great Lakes Basin Commission.

Mr. Fascell. Is that comprehensive or is that financial?

Dr. Dworsky. To the extent of our present-day planning techniques, one would call it comprehensive.

Mr. Fascell. Is there a comparable organization on the Canadian side?

Dr. Francis. As far as I know, they have not engaged in that kind of comprehensive planning on the lakes. There is the legislative framework within the Canada Water Act, but that has been used with particular river basins elsewhere in the country.

Mr. Fascell. If IJC were to be given the comprehensive planning function as such, would that require some action on the Canadian side since they do not have a comparable comprehensive plan?

Dr. Dworsky. They do not have any in the Great Lakes, but they have appropriate planning arrangements like that in the Okanagan River Basin in British Columbia where they have developed a similar format for a comprehensive plan.

Mr. Fascell. I wonder whether we would be slowed down since the Canadians might feel they do not have that and are not ready to go into it yet.

Dr. Francis. They have the arrangements to develop it but there would be time needed to develop comparable comprehensive data.

Dr. Dworsky. Canada has organized itself in many ways better than we have. For example, the Center for Inland Water Studies in Burlington under the direction of James Bruce is one of the really effective new organizations on the Great Lakes.

We have nothing like that on the U.S. side. Canada has a $22 million establishment staffed with a wide range of technologists and social, political, and physical scientists and they have done a magnificent job. I have been ashamed in many ways of our lack of comparability.

Mr. Fascell. I was not suggesting by any means that we had all of the information or institutions. I did not mean that at all. I was again looking at the time factor.

* * *

Mr. Fascell. Mr. Kazen, we are glad you have returned.

Mr. Kazen. Mr. Chairman, I had another subcommittee meeting dealing with our energy problems.

Mr. Fascell. The Japanese mission on international energy problems.

Mr. Kazen. I am sorry that I have to leave it, it is awkward to try to ask any questions at this point after not having been in the room during much of your testimony.

Back in your presentation before I left you said that the joint agency would not tackle all the problems at the same time.

On page 36 you have your primary level of international concern and I know there are many, many primary categories.

Dr. Dworsky. Yes, sir.

Mr. Kazen. How would these be dealt with if you did not tackle several at the same time? How would you set your priorities as to what to go about working out first?

Dr. Dworsky. I think we are saying, Mr. Kazen, that we did not want to indicate that everything could or should be handled all at one time. On the other hand, the nature of the problems will, in fact, determine the priorities.

If, for example, we find that the new treaty is managing well the water pollution area, that means for the next few

years we can begin to give our attention to the high water or low levels of the Great Lakes and concentrate our work there.

I was trying to be cautious in the sense of not saying to you that we are looking for an organization that will take on all of these tasks at one time, but rather that the organization will grow and will develop in a careful way.

On the other hand, they will have whole sets of documents, files, knowledge, vast organizations like the Corps of Engineers, and fisheries people in Canada and the United States, that they can lean upon to make the institution work. The task is to set up an institution that can schedule its work and let it begin to bring some management skills to bear on the multiple problems of the Great Lakes.

If it were decided to do all tasks concurrently, that is great. But, I was trying to say it could grow, based upon whatever schedule seemed appropriate. The other suggestion we made, while you were gone, was that we wanted a program to be responsible to the Congress and Parliament, which meant that you and your colleagues would be able to help determine how fast we wanted them to go.

Mr. Kazen. I can realize what the problem would be, because with such a vast area, when we talk about the Great Lakes, it is not something minute, and various parts of Canada and the United States would have various interests.

One section might be interested in pollution at the very same time that fisheries was having problems. I suppose that this is why these subjects have been dealt with separately in the past, isn't it?

Dr. Dworsky. Partly so, sir. Let me suggest to you, for example, that if I were to tell you that Canada and the United States jointly have not given any direction to any organization to jointly examine the question of water pollution control in Lake Superior and Lake Huron until April 15, 1972, you would say that this is impossible.

The fact of the matter is that Canada and the United States have not given to any agency the responsibility to look at the waters of the lake. I am not talking about boundary waters at St. Mary's. They gave that resolution to them in 1946 and earlier in 1912.

The boundary waters at the Sault and Detroit and at Niagara were the principal early concerns. The 1964 reference gave them

the direction to look at Lake Ontario and Lake Erie, but it was not until this agreement of this date that I have quoted that the two countries have said to the IJC for the first time, look at the problem of the lakes of Superior and Huron.

This is 1973. It is self-evident on its face that somebody should have been looking after this matter.

Mr. Kazen. Thank you, Doctor.

Mr. Fascell. You have done a fantastic job and the detail is amazing. The illustrations that you have given us have been helpful. But, at this point, I am still slightly confused. I wonder why the group did not select one alternative over the other, for example.

Am I to give any meaning to the manner in which they are presented as No. 1 or No. 2? Do each of you personally agree on either one of the alternatives, or do you have a difference of opinion?

* * *

Dr. Dworsky. In fact, part of this report represents the lowest common denominator you could get a group to agree upon. We were willing to go with that because we had as our objective, the seeking of an opportunity to stimulate a public debate on this matter. This is exactly what has happened and, thanks to you, we have been allowed to explore the question and to have greater illumination on the question. We also recognized we did not go into the kind of detail you are asking for.

So, as far as the report is concerned, that is the reason for not being more precise and selective.

Mr. Fascell. Dr. Francis?

Dr. Francis. A seminar, being what it is, got as far as opening the discussion. I am not prepared to say whether one or two is preferable at this stage. I think, as did others in the seminars, that this represents a reasonable proposal and a basis on which to proceed, but we recognize we should have other views and experiences brought into this question. We do not want to suggest now that we somehow or other know exactly what ought to be in specified detail.

Mr. Fascell. I can see that you gentlemen have acquired expertise in another discipline, politics. I think, frankly, my own view is that you are probably very intelligent in setting up alternatives, rather than specifics, and that gives everybody an ample opportunity to create their own ideas within the framework of your guidelines.

Dr. Dworsky. My own respect goes to the Congress, because it seems to me here is where national policy is made. Here in the Congress is where the debate ought to be undertaken. Here is where discussions and in-department alternatives have to be considered.

Here is where the responsibility rests.

Mr. Fascell. We will do the best we can.

* * *

Mr. Fascell. Gentlemen, let me thank you and all of your colleagues who have participated in the seminar. You have shown an extraordinary amount of dedication, interest, and enthusiasm. What you have done for us today, as well as the public generally, is a very significant contribution.

I can tell by looking at both of you and with the backup of your colleagues, that this is going to continue. I trust that the product now will be such that IJC will become a product itself and an initiator, and that we will, in some fashion, begin to deal with this problem before it envelops us all.

Dr. Dworsky. We wish to say that, during the course of the entire program, representatives of both Canadian section and U.S. section of IJC were participating with us. They were tremendously helpful in giving us information and sharing information and background. Mr. John Hendrickson, from the U.S. section, is here today.

We laid all of our work on top of the table, openly, and everybody knew what was going on.

Mr. Fascell. That is the way it had to be. The IJC people have been very cooperative with us. We are all traveling the same railroad track. With that kind of attitude, I hope we can make some real improvement.

Gentlemen, thank you very much.

[Whereupon, at 12 noon, the subcommittee adjourned, to reconvene, subject to call of the Chair.]

Activities Within The Great Lakes Fisheries Commission

One of the "situation" conditions covered in the Great Lakes Report concerned the effectiveness and separate nature of the Great Lakes Fishery Commission. During the summer of 1973 two sets of notes were placed before the Commission by two of its distinguished members. On the United States side, Senior scientist S. H. Smith wrote, in part,

> "The characteristics of the Great Lakes fish populations and fisheries have changed greatly since the Convention on Great Lakes Fisheries was signed on September 10, 1954. New management approaches and philosophies have evolved reflecting advances in fishery science and revisions in economic and sociologic factors related to the resource and its use. Also, the fisheries have become a less discrete resource and are inseparably entwined with the full range of uses of the Great Lakes for recreation, navigation, domestic and industrial water supply and waste disposal, and the relationship of these to urban, agriculture, and industrial land development within the drainage area.
>
> In consideration of these changes, it seems that the terms of reference of the Convention on Fisheries of the Great Lakes of 1954, and the modus operandi and the duties of the Great Lakes Fishery Commission should be reviewed and appropriate revisions made where necessary to provide for the most meaningful contributions for the rehabilitation and optimum development of the Great Lakes fishery resource. Any revision should enhance the strengths and accomplishments that the Great Lakes Fishery Commission has enjoyed to date, and take advantage of the experience and accomplishments of other fishery commissions. Specific considerations should include.
>
> 1. Alignment of objectives, responsibilities, and duties reflecting the broad relation of fishery requirements to total resource use and planning. Develop a mechanism for formal interactions with the International Joint Commission and major regional agencies and institutions of Canada and the United States, which have responsibilities in research, planning or management that can have an impact on fisheries.
>
> 2. Revise the operating protocol of the Great Lakes Fishery Commission (GLFC) to provide

for more functional interaction between the Contracting Parties and their constituent states and province for the establishment and allocation of international quotas and development of management schemes under Commission auspices. The Convention for the North Atlantic Fisheries (Articles VII and VIII) and experience of the International Commission for North Atlantic Fisheries for establishing and allocating quotas in multijurisdictional management may be instructive for modifications of the Great Lakes Convention and the Great Lakes Fishery Commission structure.

* * *

The Scientific Advisory Committee recommends that the Commission establish an ad hoc committee composed of two commissioners, two fishery resource administrators, two scientists, and two federal representatives who are broadly experienced in international conventions, with a representative for each category from each country. The committee should review the Great Lakes Convention and the organization and activities of the Commission in relation to the present and anticipated situation on the Great Lakes and report to the Commission at its Annual Meeting in 1974 concerning need and possibilities for revision of the Convention, the Commission's organization, or both."

Dr. Henry A. Regier of Canada addressed the following about the Great Lakes Fishery Commission - Structures and Functions to the Commission.

"The political, social, environmental and industrial realities of 1973 - as they relate to the fisheries of the Great Lakes - are perceived to be very different from those current in 1955 when the GLFC was created. By 1985 our perceptions of the new realities will likely be as different from those of 1973 as are the present concerns from those of 1955.

The GLFC was structured to address one major problem of 1955 - the lamprey. Secondarily it was granted a research co-ordinating role; it has also gradually developed an initiatory function with research. Are the present structure

and functions adequate for 1973's problems? If so, will they be adequate in 1985? If not - to either or both queries - then how might the GLFC be restructured? Or should it perhaps be phased out of existence to permit the development of a new institution?

Questions similar to those above have been asked or are being raised with respect to agencies responsible for renewable resources and the natural environment at all levels of government from municipal through to the United Nations. With respect to the major jurisdictions on the Great Lakes many if not all the relevant institutions have recently been reorganized in a major way. The IJC and various inter-agency bodies and committees in Canada and the USA are coming under critical scrutiny and may soon be rejuvenated or restructured.

It would seem to be an odd and highly unlikely coincidence that the GLFC, among all agencies, would alone continue to be well suited to its actual or potential role under its traditional modus operandi. More to the point, various judgments expressed in informal discussions with a spectrum of experts long active in the GLFC clearly imply that it badly needs a thorough overhaul and perhaps a major restructuring. The consensus among the malcontents appears to be that present shortcomings cannot be blamed on GLFC commissioners, officers, secretariat, committee members, etc. Rather they stem from a changed set of circumstances - themselves partly the desired result of past Commission initiatives - for which the present structure is relatively ineffective.

In the past nothing much could be done in such situations until some major crisis developed that forced new initiatives to be undertaken. Very recently both policy and program planning have come to be widely accepted as a legitimate and necessary role for North American government agencies. Laissez faire is now passe. Presumably the commissioners are now entitled to view broader planning as a de facto responsibility of the GLFC. If so, then the following outline might serve as a basis for discussion on how policy and program planning might proceed with a view to restructuring and/or strengthening the GLFC.

Suggested steps

1. Review of the basic structure of the institution, by political scientists in collaboration with Commission officers.

For a possible framework for the review see: 'A Proposal for Improving the Management of the Great Lakes of the United States and Canada,' Canada-United States University Seminar, January 1973.

2. Review of Great Lakes agencies' management goals and policies concerning fisheries by managers, perhaps under the following headings: lamprey control, recreational fisheries, commercial fisheries, environmental quality, multi-purpose tradeoffs. Also to be reviewed is each agency's policy on how to solve the common property problem with fisheries, either recreational or commercial or both.

3. Review of Great Lakes agencies' research goals and policies concerning fisheries, by researchers, perhaps under the same headings as in item 2 above.

4. Review of the operations of the Commission, in its various parts and functions, by operational analysts, to improve its efficiency.

5. Following completion of review papers on items 1 and 4:

a) compare them for congruence and consistency one with the others, and suggest how incongruities and inconsistencies might be reconciled; and

b) compare what has emerged from the exercise through 5(a), with overall goals and policies for the entire mix of society's demands on the Great Lakes.

Tasks 5(a) and (b) may be assigned to an interdisciplinary team of political scientists, managers, researchers, and operational analysts.

6. Develop a strategic plan for those goals and policies relating to fish that are shared by all the major jurisdictions on the lakes.

This task may be accomplished by the same professionals that are assigned to item 5, plus assistants from each of the major jurisdictions that are thoroughly familiar with the capabilities of the planning and executive functions of the relevant agencies.

7. Develop regional tactical plans for resources shared by two or more jurisdictions, by an interdisciplinary team of regional experts."

Action taken during June, 1973 by the Great Lakes Fishery Commission included the following:

..."B. Proposals for review of Commission structures and functions

In considering its future course of action and objectives, the Commission reviewed documents submitted by Dr. H. A. Regier (The Great Lakes Fishery Commission - Structures and Functions) and Dr. S. H. Smith (Review of Great Lakes Fishery Convention and Commission). There was consensus that in view of the changing times, it was incumbent upon the Commission to review its activities to assure that its functions were an integral part of the total scientific plan for the conservation and enhancement of the natural resources of the Great Lakes. Consequently, the Commission authorized the appointment of a subcommittee to investigate proposals taking cognizance of the changing concepts and objectives of related governmental institutions involved in the planning and management of the international natural resources of the Great Lakes. It was suggested that the subcommittee be composed of a judicious selection of Commission members and governmental agency staff members from both countries. The Commission's Secretariat would assist the subcommittee in compiling and circulating documentary material and recommendations to the Commission several weeks prior to the Interim Meeting in December 1973."

Further Congressional Action Related To The Great Lakes Inter-University Seminar Report

On September 27, 1973 Congressman Charles A. Vanik (Ohio) commented in the Congressional Record of that date his concern about the Senate Confirmation of the International Joint Commission Members. Mr. Vanik, in recording his statement made reference to "A Proposal For Improving The Management of the Great Lakes of the United States and Canada, an excellent binational study prepared by Cornell University's Water Resources and Marine Sciences Center." Mr. Vanik's statement and a copy of H.R. 9858 dated August 2, 1973 follows.

SENATE CONFIRMATION OF THE INTERNATIONAL JOINT COMMISSION MEMBERS

HON. CHARLES A. VANIK

OF OHIO

IN THE HOUSE OF REPRESENTATIVES

Thursday, September 27, 1973

Mr. VANIK. Mr. Speaker, shortly before the summer recess, I introduced a bill which would require that the members of the three-man American section of the International Joint Commission be confirmed by the Senate after their nomination by the President.

When the International Joint Commission—IJC—was formed in 1909, it was responsible for the resolution of matters of disagreement over the shared boundary waters of the United States and Canada. Much of that boundary passes through the Great Lakes, and thus the agreement stated:

> The IJC shall have jurisdiction over and shall pass upon all cases involving the use or obstruction or diversion of the waters . . .

That initial authority has expanded over the last six decades to include many additional and larger responsibilities. For example, the Great Lakes Water Quality Agreement of 1972, signed by President Nixon and Prime Minister Trudeau, gave additional authority to the IJC in the area of water pollution control.

In total, the Commission now has responsibilities that have impact on water quality, hydroelectric power production, deep draft navigation, and management of the water levels of the Great Lakes.

Water level control has come to be one of the most important areas of IJC jurisdiction. Many of my colleagues are familiar with the unprecedented high water levels in the Great Lakes during the last 2 to 3 years and the attempts to get someone, including the IJC, to implement management and control programs to stabilize the fluctuating water levels. Enormous property losses have resulted from the recent historic highs and still no comprehensive management system has been proposed.

A comprehensive Great Lakes water levels study to look at water level problems and solutions was commissioned by the IJC in 1964, but it is still not completed, and despite an announced completion date of October of this year, it appears that the public will not see the complete study until 1974, almost 10 full years after it was started. This fact alone is extraordinary evidence of the IJC's insensitivity, sluggishness, and lack of response to the two countries it is meant to serve.

In those 10 years the lakes have gone from famine to flood; from low-water conditions where pleasure boats have been grounded at dockside, to high-water levels that have seen hundreds of feet of shoreline eaten away, homes smashed and broken to pieces by waves, and practically every human effort to save personal property and belongings thwarted by the storm-driven waters.

But Mr. Speaker, the correct application of controls and regulations by the IJC can help to at least minimize the enormous fluctuations and make the lives of the 40 million Canadian and American Great Lakes' residents easier and safer.

The problems of stable water levels have grown more and more complicated: ship owners would like to deepen the channels and rivers connecting the Great Lakes so bigger and heavier ships can bring in more cargo; hydroelectric producers want to divert more water and keep water level flows high to allow them to make more electricity; industrial and domestic water consumption is rising while their pollution discharges present other problems; millions of Canadians and Americans want more recreational space; homeowners demand action to save their land from eroding into the lakes.

All these problems must be reconciled. But such reconciliation is difficult. Optimum water levels for one interest group are often anathema for the others. Whose interests are more important? Can we leave shoreline residents at the mercy of the elements? These are the questions that a modern and responsive IJC must deal with.

We can see that the job of the International Joint Commission is not to be taken lightly. Its members must be fully qualified in an area of hydrology, engineering ecology, or international affairs in order to adequately [illegible] the Commission deteriorate into a patronage agency or allow unqualified members to be appointed.

Senate confirmation of the IJC commissioners would serve several ends, Mr. Speaker. Most importantly, it will show the President and the Commission itself that the Congress expects more from the IJC. It will increase the quality of the Commission and insure that its commissioners are genuinely qualified to serve on an agency with these large and important responsibilities. It will help to increase the public visibility of the IJC; despite a 60-year existence, the IJC has remained low-key in word and deed, and the Canadian and American citizenry it serves often remain unaware of its purpose and activity.

I hope that the public visibility will lead to increased public access to the Commission. The IJC does hold frequent public hearings to help them assess problems, but the public is not allowed access to the executive meetings. Even after a request from my office, the Commission refused to allow us to examine the minutes of the executive meetings. I find that unjustifiable, Mr. Speaker. We cannot be sure what they are doing in their meetings—whether they are playing cards or earnestly considering problems that effect millions of people and billions of dollars of property.

The public is also barred from attending the IJC's investigation and surveillance board meetings. In December of 1972 there were a total of 28 of these boards, according to "A Proposal for Improving the Management of the Great Lakes of the United States and Canada," an excellent binational study prepared at Cornell University's Water Resources and Marine Science Center. These boards make many important and far-reaching decisions that will be recommended to the IJC itself for final consideration.

Compounding the lack of freedom of public access to the IJC's proceedings is the fact that the public is also denied inspection of the technical boards' periodic progress reports to the IJC. As of this date, my office and all other Members of Congress are apparently denied that right also.

Mr. Speaker, the future shows every prospect of the IJC's responsibilities increasing, with an accompanying increase in complexity of the problems and matters to be considered. We must be sure that they can and do carry out their tasks. I hope that my colleagues will give full consideration to legislation providing Senate confirmation of the American members of the International Joint Commission.

93D CONGRESS
1ST SESSION

H. R. 9858

IN THE HOUSE OF REPRESENTATIVES

AUGUST 2, 1973

Mr. VANIK introduced the following bill; which was referred to the Committee on Post Office and Civil Service

A BILL

To require that the three United States Commissioners on the International Joint Commission of the United States and Canada be appointed by the President by and with the advice and consent of the Senate.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the three United States Commissioners authorized to be appointed to the International Joint Commission of the United States and Canada by article VII of the treaty entitled "Treaty with Great Britain relating to boundary waters between the United States and Canada", signed January 11, 1909 (36 Stat. 2448), shall be appointed by

the President by and with the advice and consent of the Senate.

SEC. 2. The provisions of the first section shall only apply with respect to commissioners appointed after the date of enactment of this Act.

93D CONGRESS
1ST SESSION

H. R. 9858

A BILL

To require that the three United States Commissioners on the International Joint Commission of the United States and Canada be appointed by the President by and with the advice and consent of the Senate.

By Mr. VANIK

AUGUST 2, 1973
Referred to the Committee on Post Office and Civil Service

On December 11, 1973, Senator Nelson (Wisconsin), for himself and Senators Hart (Michigan) and Hathaway (Maine) introduced Senate Bill S2797 requiring that I.J.C. Commissioners from the United States be appointed by the President with the advice and consent of the Senate.

By Mr. NELSON (for himself, Mr. HART, and Mr. HATHAWAY):

S. 2797. A bill to require that the three U.S. Commissioners on the International Joint Commission of the United States and Canada be appointed by the President by and with the advice and consent of the Senate, to establish fixed terms of office for such Commissioners, and to make the Commission bipartisan. Referred to the Committee on Foreign Relations.

Mr. NELSON. Mr. President, the border between the United States and Canada is the longest unguarded boundary in the world. Of that boundary, approximately 1,400 miles is formed by waterways, either lakes, rivers, or canals. Since 1909, all authority of these waterways, which includes not only the Great Lakes but the entire American-Canadian Northern boundary area has rested in the hands of the International Joint Commission on the Great Lakes composed of three Canadian Commissioners chosen by the Queen with the recommendation of the Government Council of Canada and three American Commissioners, who in the past have been chosen by the President with no oversight by any congressional body.

The Commissioners occupy what has become a strategic policy and planning position in the last two or three decades. The settlement of people directly on the shore of the Great Lakes has increased dramatically, as has the commerce and trade which is carried on, particularly since the opening of the St. Lawrence Seaway.

This increased settlement and this heavy increase of traffic have added greatly to the responsibilities of the Commission in overseeing and planning for problems such as water and air pollution and the control of lake levels which in the last few years has destroyed millions of dollars in both public and private property. In addition, the Commissioners supervise research in wildlife habitat and the fishing industry.

More recently, the importance of finding new sources of energy has suggested the possibility of hydroelectric, or tidal power as alternatives to the fossil fuels on which we heavily rely. Certainly these sources of power involve the Great Lakes and thereby come under the control of the Joint Commission. These factors further increase the importance of the planning which the American and Canadian Commissioners must direct.

Presently, the Commissioners coordinate almost 30 technical advisory boards that are investigating problems and helping to plan for the future of the Lakes. This is a most important task. Over 15 percent of the population and economy of this country depends on the Lakes. Over 40 million people now live around the Great Lakes and by the year 2000 that figure is estimated to jump to almost 60 million. Over one-third of the border between Canada and this country transverses the Great Lakes.

The bill that I am introducing with the distinguished Senators from Michigan (Mr. HART) and Maine (Mr. HATHAWAY) is straightforward. It accomplishes three things: First, it mandates that the President's appointments have the advice and consent of the Senate; second, it legislates that these appointments have fixed terms of office; and third, it states that the Commission is to be bipartisan.

In times like these we cannot afford to be caught short in the kinds of men who will fill these positions of increasing responsibility. We must have men of vision who are professionally qualified to carry out the duties and responsibilities of this office with industry and vigor. For these reasons, my distinguished colleagues and myself have written a bill that requires the American nominees for the International Joint Commission to be subject to the same approval of the Senate as is now required of officials appointed to other positions of similar responsibility.

Only in this way, with proper congressional oversight of these appointments, can we insure that the men chosen will be of the caliber that we need to deal with the problems of the future in this area of our international waterways.

The Canadian Government has long subjected its nominees to a strict scrutiny with regard to their qualifications for office. We must begin to do the same, if these positions are to be used with the kind of imagination that is necessary for the future.

In this chapter a series of new initiatives supporting changes in the public policy of Great Lakes management have been discussed. These are ongoing efforts and the ultimate conclusions are yet to be developed. However, the objective in presenting this chapter was to illustrate that effecting changes in public policy is best achieved by developing a broad base of general awareness and concern. Publishing a report proposing new ideas is only a beginning. This must be followed up with initiatives to insure that the report is read and understood by those individuals or groups capable of adjusting public policy.

CLEANUP OF LAKES IS DEALT SETBACK BY U.S. CONGRESS

By ROSS H. MUNRO
Globe and Mail Reporter

WASHINGTON — Canada has been caught in the middle of a fight between Congress and President Richard Nixon over the cleanup of water pollution in the Great Lakes.

The cleanup program suffered a potentially major setback yesterday when Congress passed legislation that would stop the Nixon Administration from giving spending priority to water treatment facilities. The facilities are required by the Great Lakes Water Quality Agreement signed by Canada and the United States in 1972.

As an amendment to the U.S. Federal Water Pollution Control Act, the legislation was hurriedly and overwhelmingly passed by the House of Representatives on Tuesday and then by the Senate yesterday. Congressional sentiment favoring the amendment was so strong that it appeared that even if President Nixon vetoes it, Congress will force through a similar amendment early next year.

The congressional action caught nearly everyone by surprise, including the U.S. Environmental Protection Agency which administers water pollution programs. The Canadian Embassy did not hear about the amendment until after it had been sent to President Nixon yesterday for signing.

Congressmen have been angry because the tight-fisted Nixon Administration refuses to spend as much money as Congress has authorized for combatting water pollution. They became even angrier when they discovered that EPA is telling states bordering on the Great Lakes that the reduced federal grants must be spent first on the lakes rather than on downstate rivers.

Early this year, the EPA set those spending priorities largely because of pressure which came directly from Ottawa and indirectly from Queen's Park. Canadian officials feared that the Nixon Administration's budget cutbacks could spell an end to the U.S. commitment to have all Great Lakes water pollution projects completed or underway by the end of 1975.

The amendment was spearheaded by a formidable, wide-ranging coalition of congressmen—Democratic Party leaders of the anti-pollution fight such as Senator Edmund Muskie; a Republican representative from southern Ohio who feared his area is being short-changed; a conservative Democrat from northern Texas who sees a similar situation with Mexico and south Texas and John Blatnik, the powerful chairman of the House Public Works Committee who sees his financial authorizations being thwarted by the Nixon Administration.

"Understand that this is not jingoistic," stressed an aide to Senator Muskie, "it's not because we want to abrogate the treaty. It's because we want Nixon to spend the money he's supposed to."

President Nixon is "supposed" to spend $18-billion during a three-year period but EPA officials have announced that they are being allowed to spend only $12-billion. If the impounded $6-billion is released, another Senate staff official said yesterday, the Nixon Administration can still comply with the Great Lakes agreement.

"If it is the desire of the Administration to have the international agreements implemented as a priority item," Mr. Blatnik told the House, "we would suggest that they submit appropriate legislation authorizing the construction and providing a source of appropriations for the necessary works."

An EPA official said yesterday that the EPA will approach Congress for such a special authorization "if we have to, but this could only be done if President Nixon's budget officials were willing to open up the entire issue of water pollution again and, in effect, invite defeat.

Mr. Blatnik described the effect of the EPA priority rule on Ohio where "there are some $500-million worth of projects required on Lake Erie to meet our international agreements.

"They need to be constructed immediately, if we are to meet the agreements. This means that the allocation for the state of Ohio for the next two fiscal years or more would be used only on the shores of Lake Erie. There are other areas in the state that have equal priority.

The only voice of opposition to the amendment was that of Charles Vanik, a Democratic congressman representing part of Cleveland, a city considered a major culprit in the pollution of Lake Erie.

"I believe that when the President goes to Ottawa and makes a pledge to the Canadian people that our Government will spend $2-billion to clean up the lakes, the states should certainly co-operate in fulfilling that pledge."

The amendment, Mr. Vanik said, "will be a setback of our cleanup efforts on the lakes."

REFERENCES AND FOOTNOTES - PART I

[1] A Proposal for Improving the Management of the Great Lakes of the United States and Canada, a report by the Canada-United States University Seminar (1971-1972).

[2] Joint Canadian-U.S. commission established in 1912 pursuant to Article VII, Boundary Waters Treaty of 1909.

[3] Report of the United Nations Conference on the Human Environment held at Stockholm, Sweden, June 5-16, 1972. Document A/CONF. 48/14, pp. 33-34, July 3, 1972.

[4] Agreement Between Canada and the United States on Great Lakes Water Quality, signed in Ottawa, April 15, 1972.

[5] NAS/NAE, Institutional Arrangements for International Environmental Cooperation, A Report to the Department of State by the Committee for International Environmental Programs, National Academy of Sciences, Washington, D. C., 1972.

[6] See Jerome P. Pickard, Metropolitanization of the United States, Urban Land Institute, Washington, D. C., 1959, also Jerome P. Pickard, Is Megalopolis Inevitable? in The Futurist, Vol. IV, No. 5, October 1970 published by World Future Society, Washington, D. C. 20036.

[7] See James W. Fesler, "National Water Resources Administration" in Economics and Public Policy in Water Resources Development, Stephen C. Smith & Emery N. Castle, eds., Iowa State University Press, 1965.

[8] IJC Docket No. 83, a reference dated October 7, 1964 requesting the Commission to undertake a study of water pollution in Lake Erie, Lake Ontario and the international section of the St. Lawrence River and to recommend practicable remedial measures. Appropriate technical boards were formed and a report was submitted to the IJC in 1969.

[9] Report of the International Board of Inquiry of the United States and Canada, Science, Vol. 44, January 7, 1944, p. 10.

[10] Convention on Great Lakes Fisheries, September 10, 1954; 6 UST 2836; TIAS 3326 (entered into force October 11, 1955); Art. II.

[11] IJC Docket No. 82, a reference dated October 7, 1964 requesting the Commission "to determine whether measures within the Great Lakes Basin can be taken in the public interest to regulate further the levels

of the Great Lakes or any of them and their connecting waters so as to reduce the extremes of stages...experienced...". The International Great Lakes Levels Board was established; a final report is expected to be issued in late 1973.

[12]Thomas M. Patterson and Harley F. Lawhead, History and Present Status of Regulation and Regulation Studies of Water Levels and Flows on the Great Lakes, in proceedings of the Great Lakes Water Resources Conference, June 24-26, 1968, Toronto, sponsored by the Engineering Institute of Canada and the American Society of Civil Engineers, p. 217.

[13]The present operating dates for the Great Lakes-St. Lawrence Seaway system are April 1 - December 15, with some annual variation, depending on climatic conditions. The 1971 season was the longest on record, running from April 1, 1971 into February 1972.

[14]Rivers and Harbors Act of 1970; P.L. 91-611, Section 107. The Winter Navigation Demonstration Program is being conducted by the U.S. Army Corps of Engineers as lead agency in an organization of ten federal agencies comprising the Winter Navigation Board.

[15]Federal Water Pollution Control Act Amendments of 1972, October 18, 1972; P.L. 92-500, 86 Stat. 816. In Canada, the Federal Canada Water Act of 1970 which provides an important mechanism for joint efforts in interprovincial and binational water management programs; The Federal Fisheries Act Amendments of 1970 which authorize the setting of national effluent standards for all industries discharging wastes into waters inhabited by fish.

[16]Standord H. Smith, Species Succession and Fishery Exploitation in the Great Lakes, in Journal of the Fishery Research Board of Canada, 1968, pp. 667-693.

[17]The discussion on user charges of the St. Lawrence Seaway System is taken from Eric Shenker, and John W. Wilson (University of Wisconsin) The First 7 Years of the St. Lawrence Seaway, reprinted in 112 Cong. Rec. 24661 (1966).

[18]Merchant Marine Act of 1970, October 21, 1970; P.L. 91-469; 84 Stat. 1018, Sect. 43.

[19]Shenker and Wilson, supra note 17, at 24661.

[20]National Environmental Policy Act of 1969, January 1, 1970; P.L. 91-190; 83 Stat. 852.

[21]Employment Act of 1946, as amended, February 20, 1946; 60 Stat. 23.

[21]Employment Act of 1946, as amended, February 20, 1946; 60 Stat. 23.

[22]Design for Development: The Toronto-Centred Region, a report issued by the Government of Ontario on May 5, 1970, as part of a larger land use analysis and planning program for Ontario known as Design for Development initiated in April 1966 by the Government of Ontario.

[23]Hawaii Rev. Stat. Ch. 205 (Land Use Commission) 1968, as amended (Supp. 1969).

[24]Environmental Control Law of 1970, Act No. 250 of the Vermont Laws; 10 Vt. Stat. Ann. Ch. 151.

[25]Wisconsin Shoreland Zoning Law; Wis. Stat. Ann. Ch. 59.971, 144.26 (Supp. 1970).

[26]Laws of New York, 1971, Vol. I, Ch. 479. This Act provides for the creation of agricultural districts to carry out the declared policy of the state to conserve and protect agricultural lands from the pressures of urbanization.

[27]Fred Bosselman and David Callies, The Quiet Revolution in Land Use Control, prepared for the U.S. Council on Environmental Quality (U.S. Government Printing Office: Washington, D. C.) 1971.

[28]The other existing Canada-United States treaty body, the Great Lakes Fishery Commission, established pursuant to the 1954 Convention on Great Lakes Fisheries (supra note 9.), has a more specialized mandate, to wit: implementation of a program to control the sea lamprey and the formulation and coordination of research programs designed to improve the fisheries.

[29]Both governments had appointed their respective members by November 10, 1911; the Commission held its organizational session in January 1912 and its first regular meeting on April 13, 1913. See 49 Cong. Rec. 3123 (1913).

[30]Treaty with Great Britain Relating to Boundary Waters, and Questions Arising Between the United States and Canada, January 11, 1909; 36 Stat. 2448 (1910); TS 548 (entered into force May 13, 1910); (hereinafter 1909 Treaty or Boundary Waters Treaty of 1909); preamble.

[31]Id. Art. VII

[32]Id. Article VII omits mention of advice and consent of the Senate

[33]Id.

[34]Supra note 30, Arts. III & IV.

[35]Supra Note 30, Art. IX.

[36]Supra note, 30, Art VIII.

[37]Supra note 35.

[38]Information provided by U.S. Section, IJC (December 1972).

[39]Supra note 4.

[40]Id., Art. VII.

[41]49 Cong. Rec. 4172 (1913).

[42]Art. XIV of the Treaty declared that it "shall remain in force for five years, dating from the day of exchange of ratifications (May 10, 1910) and thereafter until terminated by twelve months' written notice given by either High Contracting Party to the other".

[43]J. L. MacCallum, The International Joint Commission, Canadian Geographical Journal, Volume LXXII, No. 3, March 1966, p. 2.

[44]A. D. P. Heeney, Along the Common Frontier: The International Joint Commission, pamphlet prepared for the Canadian Institute of International Affairs, Vol. XXVI, No. 5, July 1967, p. 7.

[45]Matthew E. Welsh, The Work of the International Joint Commission, an article from the Department of State Bulletin reprinted in the Congressional Record, 115 Cong. Rec. 25032 (1969).

[46]See Richard B. Bilder, Controlling Great Lakes Pollution: A Study in United States-Canadian Environmental Cooperation, 70 Michigan L. Rev. 469 (1972), p. 521.

[47]The permanent staff of the U.S. Section in mid-1972 consisted of one full-time Chairman and two part-time commissioners; an Executive Director; a Secretary and two secretaries.

[48]49 Cong. Rec. 4175 (1913).

[49]Information provided by U.S. Section, IJC (July 1972).

[50]Id. (December 1972).

[51]Matthew E. Welsh and A. D. P. Heeney, International Joint Commission: United States and Canada, a paper presented at the International Conference on Water for Peace, May 23-31, 1967, Department of State, Washington, D. C.

[52]46 Cong. Rec. 335 (1911).

[53]As of mid-1972, one entry had been made in the Congressional Record since the 1st session of the 86th Congress (1959) to wit: insertion into the Record by Senator Hartke of an article on the IJC written by the then Chairman of the U.S. Section, Matthew E. Welsh (1969); see 115 Cong. Rec. 25032 (1969).

[54]An encouraging exception to this state of affairs is the interest in the IJC taken by the Great Lakes Conference of Senators, a group under the chairmanship of Senator William Proxmire of Wisconsin.

[55]Bilder, supra note 46 at 550.

[56]In actuality, however, stream pollution investigations date from 1910 when Dr. Allan J. McLaughlin of the U.S. Public Health Service was detailed to carry out a survey of cities in the Great Lakes Basin, with instructions to investigate the extent of pollution of their water supplies and its relationship to the prevalence of typhoid fever and other waterborne diseases. Those studies (1910-1911) revealed the correspondence between typhoid fever rates and sewage-polluted drinking water supplies taken from lake waters.

[57]49 Cong. Rec. 3124 (1913).

[58]IJC, Final Report on the Pollution of Boundary Waters Reference (1918) p. 31.

[59]Id. at 51.

[60]Id.

[61]Don C. Piper, The International Law of the Great Lakes, Publication No. 30, Duke University Commonwealth Studies Center, Duke University Press, Durham, N.C., 1967, p. 86. See also Bilder, supra note 46 at 491.

[62]IJC Doc. No. 54 (1946).

[63]IJC Doc. No. 55 (1948).

[64]Concerning water quality objectives or standards, Bilder, supra note 5 at 493 is quoted as follows: "The idea of recommending technical water quality objectives was a major innovation...." "The objectives, which were the first of their kind to be formulated on an international basis, anticipated national action in both countries; the concept was ultimately embodied in the (U.S.) federal Water Quality Act of 1965 fifteen years later."

[65]Jordan, Frederick J.E., Recent Developments in International Environmental Control, 15 McGill L. Rev. 279 (1969).

[66]Id, pp. 298-299.

[67]Id., pp. 299-300.

[68]Id., p. 300.

[69]Id., p. 301.

[70]Id., p. 301.

[71]Livingston T. Merchant and A.D.P. Heeney, Canada and the United States-Principles for Partnership, June 28, 1965, Department of State Bulletin, August 2, 1965, U.S. Government Printing Office: Washington, D. C. (1965).

[72]Ambassador Heeney was at the time serving as Chairman, Canadian Section of the IJC; he was in that capacity 1962-1970.

[73]Paragraph No. 45.

[74]Id.

[75]Id.

[76]White House Press Release (Austin, Texas) dated July 12, 1965.

[77]111 Cong. Rec. 25394 (1965).

[78]Reps. Tupper (Me.), Ellsworth (Kans.), Frelinghusen (N.J.), Horton (N.Y.), Mathias (Md.), Morse (Mass.), Mosher (Ohio), Reid (N.Y.), Robinson (N.Y.), and Smith (N.Y.).

[79]Supra note 77 at 25397.

[80] Id.

[81] Lyle E. Craine, Final Report on Institutional Arrangements for the Great Lakes, report prepared for the Great Lakes Basin Commission, March 15, 1972, p. II-4.

[82] Id. at S-2.

[83] Water Resources Planning Act of 1965, July 22, 1965.

[84] Canada Water Act of 1970, Can. Stat. c.52 (1969-1970).

PART TWO

AN EXPERIMENTAL OPERATIONS OFFICE

INTRODUCTION - PARTS TWO AND THREE

As referred to in the Hearings before the Inter-American Subcommittee under the Chairmanship of Congressman Fascell, a third phase of the research effort on the Great Lakes Basin consisted of an attempt to develop further the idea of a binational management office with wide coordinative responsibilities for the Lake Erie and Ontario Basins. Concurrently with the Canada - United States University Seminar (December 1971 - June 1972), a second graduate student group at Cornell University investigated, under the guidance of Professors Leonard B. Dworsky, C. Donald Gates and David J. Allee, selected elements of a hypothetical joint management office. As part of this effort, seven graduate students completed five thesis for advanced degrees, and two research papers on some facet of a joint regional management office.

The type of joint office conceptualized was one designed to carry out a coordinative role in the management of a wide range of resource-use problems. The list of such problems used in the investigation included: water quality; municipal/industrial water supply; agricultural water supply; lake level control; hydropower; flood control; navigation; shoreline erosion; fish and wildlife protection; water-based recreation; solid waste disposal; air quality; economic development; agriculture; and transportation.

In our attempt to simulate a Great Lakes operations office jointly established and operated by Canada and the United States, we endeavored to examine a selected number of those problems which both the designers of such an office as well as those who are ultimately charged with its direction would be obliged to address.

An obvious initial consideration, for example, would be the structure and functions of a modified joint agency. This topic was dealt with in Natural Resources Management in the Great Lakes Basin by James A. Burkholder. A primary task of an operations office would be the collection, interpretation and dissemination of data and information pertaining to the Basin. This important area was treated in An Information System for the Management of Lake Ontario by Dale Reynolds. The role of public participation in the activities of the proposed Basin operations office was examined in detail in Public Participation in Water and Land Management by Arvid L. Thomsen. Demographic trends and problems were traced on a national scale and then examined with respect to the Lake Ontario Basin as a case study in Toward a National Population Redistribution Policy: Some Policy Issues by Lawrence W. Saunders. Special problems of environmental quality management along an international boundary was the subject of Environmental Management of the Great Lakes International Boundary Areas: A Case Study of the Niagara Urban Region by Donald R. Kisicki. Land use management as an integral part of the overall planning process was the subject of a paper Land Management in the Lake Ontario Basin by James M. Wolf. Finally, in his paper entitled Management of the Biological Resources of the Lake Ontario Basin, Douglas M. Carlson provided a comprehensive survey of the fish, wildlife and recreational aspects of the lake basin as well as an assessment of present conservation management practices.

These papers, in summary and in some cases revised form, comprise the balance of this Reader.

CHAPTER V

A REORGANIZATION PLAN*

Introduction

The whole thrust of this book is the urgent need to remodel present institutions in order to make possible the wiser use of the resources of an important region. The preceding chapter describes a recent joint Canadian-United States effort to examine the problem and to mark out the directions in which our respective governments might proceed. According to that study, there are basically two alternatives. One is to pursue the objective within the framework of a significantly strengthened International Joint Commission. The other departs dramatically from the status quo with the establishment by treaty of a completely new institutional apparatus specifically tailored to the needs of the region. It is important to point out that the Canada-United States University Seminar took no official position as to which of the two might be the better course. Likewise, the present authors defer an expression of preference. The consensus of the Seminar was that the decision properly belongs to the U.S. and Canadian Governments. The ultimate choice, as the Seminar saw it, depends greatly on such larger matters as the state of bilateral relations, national priorities, the perceived urgency of the Great Lakes problems and just how far both governments are prepared to go in cooperative ventures of this sort.

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*Based in part on original research done by Mr. James A. Burkholder for his master's degree thesis entitled, Natural Resources Management in the Great Lakes Basin, 1973, at Cornell University.

All the same, there is no need to wait around for the perfection of the universe. There are some practical ways in which to refine the ideas set forth in the report of the Seminar. In this chapter, for example, we arbitrarily assume that Alternative 1, a strengthened IJC, is operative and we carry it from there, describing the organizational modifications required to meet our perception of the needs of the Great Lakes region. We do not claim that our scenario is faultless or that a better variation could not be devised. It is simply one solution - one that we trust demonstrates that the ideas expressed in general terms heretofore are not so abstract but, on the contrary, are reducible to practical and manageable terms.

Basic Functions of the Revised IJC Structure

What is being postulated is a joint Canadian-U.S. governmental entity established by treaty and vested with adequate general and specific authority to permit it to serve as the locus of coordination and concern for all significant matters related to the use of the water and related land and air resources of the Great Lakes Basin. In the case of the International Joint Commission, there is treaty precedent as well as an existing bilateral body. The task remaining is to build on that foundation and this is one attempt to do that.

For clarity, it is appropriate to distinguish between the IJC - which would continue to have treaty responsibilities for those boundary waters outside the Great Lakes Basin - and the joint body postulated here to be

established within the IJC framework with responsibilities limited to the Basin. The latter shall be referred to in these pages in such terms as the IJC Great Lakes arrangement or the new IJC structure. It will initially consist of the IJC, 5 functional boards and a Great Lakes Operations Office. In addition, the term "Great Lakes policy unit" refers to those officials of this new three-part organization who are designated by the two governments to engage in policy-making or policy coordination functions.

There are five broad functional tasks regarded as the proper responsibility of the Great Lakes Operations Office. They are:

(1) Basin-Wide Policy Guidance

(2) Coordinated Information System

(3) Coordination of Research

(4) Coordinated Planning

(5) Operational Coordination

These tasks are not being adequately accomplished under existing arrangements for resources management in the Great Lakes simply because there is no existing institution possessing both the basin-wide (international) perspective and authority necessary.

Basin-Wide Policy Guidance

The 1972 Great Lakes Water Quality Agreement declares that the governments of Canada and the United States are "convinced that the best means to achieve improved water quality in the Great Lakes system is

through the adoption of common objectives, the development and implementation of cooperative programs and other measures....." The logic of this statement, in our view, should be extended beyond water quality concerns to encompass a broader range of common natural resource problems and issues relative to the Great Lakes region.

Basic to any joint effort to confront common resource management problems within the Basin are agreements on common objectives which must in turn be translated into coordinated programs. As discussed in Chapter I, there are several significant concerns in addition to water quality matters which merit equal consideration in the face of continued development around the Basin. What would be desirable is integrated bilateral consideration of all significant concerns at the policy level in a manner paralleling comprehensive basin planning approaches being pursued in other areas within each country. To accomplish this, a joint forum must be provided with the authority to coordinate in some appropriate manner the policy planning processes in both countries insofar as they relate to the water and related land and air resources of the Great Lakes. Accordingly, the bilateral focal point for Great Lakes resources management should be allowed to participate in national, state/provincial policy planning processes that affect to a significant degree the resources of the Great Lakes. In certain critical management areas, e.g., air quality, fisheries, lake levels, navigation, and water quality, the Great Lakes policy unit could take, as agreed between the two governments, an

active part in coordinating and guiding governmental policy-formulation activities in the Great Lakes region. This process has already been initiated through the IJC under the 1972 Water Quality Agreement. The Great Lakes policy unit would advisably be allowed as much latitude as possible in developing and supervising those programs it is authorized to undertake as defined in the enabling treaty frame of reference.

Coordinated Information System

Development of coordinated information system would be a basic function of the new IJC arrangement and the direct responsibility of the Great Lakes operations office. Without such a system, effective joint planning, research and related coordinating and guidance activities would be grievously impaired. The Great Lakes information unit would be an integral part of the IJC/Operations Office structure.

The proposed system should not be a center containing the sum of all knowledge generated relating to the Basin, as the amount of data involved would be so large as to overwhelm the ability to devise a method for using it. The quality of information, i.e., its reliability and usability, is more important than access to great masses of raw data.

The collection activity should be designed for the specific data and information needs and capabilities of the ultimate users. Of course, the principal user would be the Great Lakes Operations Office. However, the system could also serve to provide available material to the three levels of the two governments, their operating agencies and departments,

and non-government interests of the Basin, as appropriate. Overall, the information system is visualized as involving a two-way exchange between the existing data and information services in each country and the Great Lakes information unit. Government information systems are seen as the principal raw data and information sources, but universities and other private institutions are important ancillary sources that should be tapped.

While the primary joint management concerns to be addressed may be limited to five areas (air quality, fisheries, lake levels, navigation and water quality), the working information base should encompass pertinent data and information for the full range of concerns relating to resource-use and development in the Great Lakes region. This is particularly essential for meaningful planning and policy formulation, as these activities rely on having the "complete picture" on developments and trends affecting the Basin. For example, economic data, including such items as population densities and distributions, natural resource and related production inventories, and social and cultural attitudes on aesthetic consideration, and economic development, are factors which must be taken into account in basin-wide planning and policy formulation activities. This type of information is not readily available on a basin-wide scale at this time.

A large central computer system would not be essential to the system's function. Remote terminals with access for input (storage)

and output (retrieval) to existing central computer units in each country may be preferred, particularly from budgetary standpoints. For practical purposes however, at least a small computer operation for compilation and identification of sources and preparation or interpretation of data and information from outside units, may be necessary. The goal is to place the new IJC arrangement in a position to readily locate and utilize the full range of information needed to facilitate its basin-wide operations.

The information system should also support a basin-wide public information function. The public information section could collect pertinent information on Great Lakes developments and disseminate material of public interest throughout the region in a monthly publication or special notices as appropriate.

Coordination of Research

The dynamic economic growth and related changes in the Great Lakes region will continue to generate increasing conflicts of interest among uses and users of available resources and place ever greater stresses on efforts to maintain a high quality natural environment. At the same time such complex questions as how social, economic and political factors within the region significantly influence the nature and the extent of demands placed upon the biophysical system and the approaches toward effective resource management which may be most fruitful, are largely

unanswered. The precise nature of these influences on air, land and water resources are, for the most part, not well understood.

What is not well understood is difficult to deal with. What should be sought then is the knowledge which would provide the best possible understanding of the complete Great Lakes system, i.e., the natural system, including air, land and water, the interrelationships between these natural features and how they affect and are affected by economic and social developments in both Canada and the United States. Logically, it will take a concerted, bilateral effort to achieve even a reasonable level of knowledge and overall understanding of these interrelationships.

At present there is considerable ongoing research oriented principally to the study of the physical characteristics of the Great Lakes system. Practically every major Canadian and American university within the Basin has some type of Great Lakes research program underway. The many government agencies and departments of both countries with jurisdiction and resource interests in the Great Lakes area not only support the bulk of present research, but conduct Great Lakes oriented research programs in their own laboratories and regional offices. There are coordinated international efforts, the International Field Year on the Great Lakes in such a special effort organized for concentrated physical and biological research on Lake Ontario; it is also intended to provide information of basin-wide value. There are joint studies underway which coordinate Canadian-U.S. participation through the two international commissions with responsibilities in the Great Lakes, the IJC and GLFC. In addition, there are specific attempts being made to coordinate research activities on a basin-wide scale

through such bilateral organizations as the Great Lakes Study Group and the International Association for Great Lakes Research.

With all the apparent research activity, one would still be hard pressed to find anyone familiar with the Great Lakes research question who would consider present arrangements adequate. Furthermore, it is unlikely that the collective effort of the identified groups, even in combination with any other less formal exchanges that may exist, could satisfactorily carry out the desired coordinating task. That more then a single coordinating group is presently involved suggests the lack of comprehensiveness and integration of effort of any one group. For example, there is no single source which can identify all significant ongoing research concerning the Great Lakes area, let alone that which has been completed or is being proposed. In addition, it is not difficult to get a consensus opinion among those familiar with the present status of Great Lakes research that there are large gaps in our knowledge of the Basin which are not being filled under present arrangements.

The 1972 Great Lakes Water Quality Agreement provides for better coordination of Great Lakes research. However, the Research Advisory Board established under that agreement is to coordinate and advise on research activities in both countries as they relate to Great Lakes water pollution only. Creation of the international Research Advisory Board is a commendable step. It represents a maturing bilateral relationship which recognizes the value and need for coordinated research on Great Lakes water quality concerns. However, as important as water quality research may be at this time, there are many other areas for potential research which merit similar bilateral attention. Research in such areas

areas as the behavioral/environmental field are in the shortest supply; and when speaking in terms of environmental studies more than just water quality must be considered. The broadest possible spectrum of research concerns should be open for bilateral review and action.

A basin-wide research function organized to provide the expertise to review the present state of knowledge on the Great Lakes and related systems and to pinpoint the major gaps in our understanding of the total system would be of great benefit to both Canada and the United States. The postulated Great Lakes Operations Office of the IJC could best provide this service. With coordinating and guidance responsibilities should go some means (authority and funds) to stimulate continuation of needed research and to initiate new research to fill in the gaps of desired knowledge.

Research is especially important for long-term planning and management. As such, the research function should be expected to play a central role in supporting both the planning and policy formulation activities. The information system would, of course, be closely involved with the research function.

Coordinated Planning

Coordinated planning on a comprehensive level is seen as a key to any meaningful basin-wide endeavor - one that only a binational arrangement can provide for the Great Lakes Basin. Jointly agreed upon objectives are the premises for joint planning, i.e., planning is required to translate common purpose into appropriate joint programs for action. The proposed IJC Great Lakes arrangement should have a planning capability;

the following will describe the desired features of that planning role.

Ideally, the characteristics of the planning process include (a) the coordinated collection of all possible facts on the problems or issues; (b) the analysis of these facts in an objective setting; (c) the development of alternative solutions as guides to decision-making bodies in determining courses of action; and (d) the appraisal of results in implementing the plan and the initiation of review, modification, and updating of the plan to meet future developments.[1]

Of course, in the real world there are a number of constraints that operate to make less than optimal this ideal planning process just described. Among the many possible limiting factors are: lack of enabling legislation to plan comprehensively; appropriations limitations which in reality set the scope of planning efforts regardless of need; limited technology and/or rapid new technological innovations which may make rigid long-term plans unrealistic; the difficulty in making economic projections in the detail useful for planning purposes; the changing character of waterways and related natural systems due to continuous public and private development; and the continuous development of new industrial products many of which may have significant impacts on natural systems both in production and in use. One more limiting factor, possibly the principal constraint in terms of planning for the entire Great Lakes system, is the sharing of responsibilities for natural resource management between several levels of government, in not just one but two countries, i.e., the constraints of intergovernmental plus international relationships. It is largely to deal with these constraints that a bilateral management arrangement is being advocated.

Undoubtedly, the "ideal" planning unit cannot be devised; however, the four elements that define it provide a valid and useful framework from which to develop a planning function.

Element (a) calls for the coordinated collection of all possible facts on Great Lakes problems and issues. The comprehensive data and information collection function of the Great Lakes "Coordinated Information System" (Task 2), is conceived as providing for this basic requirement of the planning process. Conversely, part of the planning function should be identification of information required for its function and those other functions it is to support, principally the policy formulation and assumed program implementation activities.

The second "ideal" element (b) would call for analysis of all pertinent data and information to identify present, developing and potential problems facing the Great Lakes system in an objective setting. Objectivity is a key word. It is difficult to visualize how a reasonable measure of objectivity could be obtained on mutual Great Lakes problems and issues by other than a joint United States-Canadian planning group. The Great Lakes planning unit should provide equivalent United States and Canadian positions to be filled by individuals competent to assimilate and coordinate, as appropriate, the relevant planning inputs of both countries.

To satisfy the analytical function, the planning unit should be in a position to identify specific impacts of existing problems and to identify, as precisely as possible, probable effects of perceived problems and proposed new developments impinging on the Great Lakes system. In addition, the Great Lakes "planners" should be able and should be allowed

to develop possible alternative solutions to existing and perceived problems and to recommend alternative courses to proposed developments in both countries, if and as appropriate (subject to mutual agreement). Identification of possible trade offs, both short-term and long-term, for the alternative courses of action is inherent in all cases. The fundamental objective here should be to prevent or mitigate adverse impacts on the Great Lakes system.

Since the basic issues will often involve the weighing of various economic factors against corresponding environmental impacts, basin-wide analysis similar to the environmental impact statements required under Section 102(c) of the National Environmental Policy Act of 1969 (NEPA) might be employed to good advantage.[2] The sum total of the analytic effort is to provide guidance to decision-making in determining the actual courses of action (element c).

In order to facilitate an anticipatory planning approach which emphasizes anticipating needs for policy determination and the development of policy guidelines, a comprehensive plan should be prepared for the entire (international) Great Lakes Basin. The concept of comprehensive basin plans is an important and fundamental planning tool. In both countries there exists legislative authority to undertake such plans.

In Canada the Okanagan Basin Study is a joint federal/provincial planning effort initiated under the "Canada-British Columbia Okanagan Basin Agreement" of October 29, 1969. This agreement between the Government of Canada and the Government of the Province of British Columbia covers all aspects of water resources in the Okanagan Basin, and specifically states the purpose of the study is "to develop a comprehensive framework

plan for the development and management of water resources for the social betterment and economic growth in the Okanagan Basin."[3]

Since the Okanagan agreement, the Canada Water Act of September 30, 1970 was enacted.[4] This Act provides a ready legislative platform for cooperative federal-provincial planning ventures like the Okanagan Study, where it is agreed "that the restoration of quality or the preservation of it in a particular basin or coastal strip is of concern to both governments" (federal-provincial).[5] In describing the planning process, the Act calls for the formulation of "comprehensive water resource management plans including detailed estimates of the cost of the implementation of those plans and of revenues and other benefits likely to be realized from the implementation thereof based upon examination of the full range of reasonable alternatives and taking into account views expressed at public hearing and otherwise by persons likely to be affected by implementation of the plans."[6] Joint federal-provincial basin boards can be set up under a formal agreement to supervise broadly based planning committees.

There is an immediate example of the desired type of interjurisdictional framework planning effort in the United States with the United States Great Lakes Basin Framework Study. This study is conducted under direction of the Great Lakes Basin Commission (GLBC), a federal-states agency created under Title II of the Water Resources Planning Act of 1965.[7] The GLBC has work groups and task forces much as the Canadian planning effort briefly described above provides for planning committees. The comprehensive framework planning approaches developed in both countries are quite similar. It would not appear that difficult to extend the principles and

processes familiar in each country to provide for a basin-wide (international) framework plan.

The basin-wide planning function should further provide that the joint planning unit be authorized to serve as the principal coordinating unit for federal, state/provincial, interstate, local and nongovernmental plans for the development of water and land resources in the Great Lakes Basin. Only in this way could a true basin-wide viewpoint be adequately developed by the international group.

Characteristic (d) refers to the continuous review and up-dating of plans. Obviously, this is essential to keep an organization's policy-making function current and effective. A built-in flexibility is needed here. Without the authorities and capability to initiate new efforts and/or adjust original plans, a useful planning function could not be continued. In general the planning function must be given the latitude and means to provide the necessary support for sound policy and management decisions within the IJC's Great Lakes units defined scope of coordinating, implementing and guidance responsibilities and authorities. This has significant implications for translating bilateral plans into action, a facet which will be discussed under the final task, "Operational Coordination."

Operational Coordination

The mutual agreement of Canada and the United States to some measure of meshing objectives, joint policy formulation and coordinated research and planning would mean very little unless the concepts for these activities can be translated into workable implementing programs. Operational

coordination, then, has to do with facilitating both domestic programs as well as the joint undertakings that are implemented to improve resource management in the Great Lakes Basin. This particular task is linked in important ways to many aspects discussed in the previous four broad functional tasks.

It must be assumed that each country will be reasonably prepared to carry out programs to fulfill their respective agreement or treaty obligations. However, some joint mechanism, with responsibilities for assisting in implementation of agreed upon programs and other measures is still needed. There can be no assurance that joint efforts will, or are serving achievement of established bilateral objectives without a co-ordinated monitoring or surveillance function. The results of original programs must be analyzed and reported upon with recommendations for new and/or revised programs as appropriate. The total arrangement must have a designed flexibility to permit continuous review and change in approaches when needed to meet new problems, to incorporate new objectives and to utilize new scientific findings and developments in technology as these emerge. The new IJC arrangement is the intended instrument for facilitating this necessary common effort.

These are not completely new ideas. The 1972 Great Lakes Water Quality Agreement has assigned the IJC a number of responsibilities and functions to coordinate the implementation of that agreement and to assist the two countries in their efforts to restore and protect the water quality of the Great Lakes. Generally, the Commission is to monitor the success of agreed upon pollution abatement programs, make recommendations for new programs and make regular reports to the governments and the public.

The specific responsibilities and functions assiged to the IJC by the two governments are:

1. Collection, Analysis and Dissemination of Data and Information on Great Lakes Water Quality
2. Advice and Recommendations to Governments on Boundary Water Pollution Matters
3. Coordination Assistance for Joint Activities Undertaken Pursuant to the Agreement
4. Coordination Assistance for Great Lakes Water Quality Research
5. Annual Reporting to Governments on Program Progress and Effectiveness
6. Discretionary Special Reports to Governments and Public on any Great Lakes Water Quality Problem
7. Discretionary Authority to Publish Its Own Documentation Prepared in the Discharge of Its Functions Under the Agreement
8. Authority to Independently Verify Data and Information Submitted by Governments
9. Authority to Establish the Great Lakes Water Quality Board
10. Authority to Establish the Great Lakes Research Advisory Board
11. Authority to Establish a Regional Office and Other Subordinate Bodies

These kinds of functions and authorities now applied to the problems of water quality in the Great Lakes would be extended, in our model, to four other problem areas: air quality, fishery management, lake level control and navigation. To be sure, this grouping constitutes one-third of the complete set of Great Lakes resource management problems identified by the Canada-United States University Seminar. Nevertheless, an initial focus on these five by the new IJC Great Lakes arrangement, seems desirable for at least three reasons that come to mind. First, with the initial focus on five, the stage for a comprehensive and integrated Great

Lakes resource management scheme is thereby set and the entire process may commence. Second, it would be unfair and imprudent to overload the new organization as it struggles through the difficult early stages of its existence. Finally, it is not necessary to try to tackle all of the problem areas at once; the others can be addressed and integrated into the system as the need arises, in a natural, evolutionary manner.

The initial five problem areas would be the subject of both the surveillance and mediation functions of the organization, whereas most of the remaining ten problem areas would come under the surveillance role only. This is the case because many of the latter group are by their nature primarily of domestic concern and responsibility and are, therefore, in appropriate areas for the mediation function (joint standards, compliance schedules, programs, etc.).

The surveillance role must not be derogated. It is the basic "bread and butter" activity of the new organization. While the more notable or more visible achievements of the organization may come about through the mediation role, the more prosaic surveillance role provides the indispensable wherewithal. Surveillance is necessary for the detection and continued monitoring of the important trends in resource-use and socio-economic development within the Great Lakes region. Only with such information inputs can the proposed policy formulation mechanism adequately serve its purpose which is to: (1) advise both governments on desirable common goals, programs, standards, compliance schedules and funding levels for a truly integrated joint management effort; and (2) to coordinate bilateral programs and implement jointly delegated responsibilities and operations, e.g., joint research, mutual enforcement and others as agreed.

There is another important aspect of the bilateral operations that must be understood - the relationship of the new IJC arrangement with the existing resource management authorities in both countries. While the comprehensive basin-wide approach can be the key to effective natural resource management within a basin, it is inconceivable that a single basin-wide institution could effectively operate on its own (or that it should), particularly in a region the size and diversity of the Great Lakes Basin. Craine, in his study for the GLBC, agrees with this view. "The idea of exercising a manager's type of flexible direction over any combination of the component functions throughout the Great Lakes Basin seems obviously inappropriate in a basin this size having highly diversified and localized problem areas. It is one thing to conceive a management agency with some (or even most) of the basin management authorities for the Maumee or even the Cuyahoga River, but it is another to centralize that kind of intervention authority in an agency with responsibilities for the entire Great Lakes Basin."[8]

Certainly, creation of any new institution or institutional re-arrangement must take cognizance of existing institutions and authorities. The importance of recognition of and integration with existing governments and agencies cannot be overemphasized. Tasks which are or could be adequately performed by the existing authorities in both countries should not be duplicated or superseded; only those functions for which there is a present or anticipated need for attention should be assigned to a new institution. This was an additional important consideration in the selection of the five problem areas discussed above - to single out for special attention those resource problem areas of the Great Lakes region for which existing planning and programs are deficient in some important

respects. Another basic objective of the new organization would be to minimize duplication of work and effort among the various concerned organizations and still see to it that all desired tasks are performed.

From a normative point of view, the IJC's new Great Lakes unit must be geared to focusing, not diffusing administrative and political energies. It must, to the maximum extent possible, improve the horizontal and vertical coordination and cooperation patterns of existing governmental units at all levels.

Specific Functions and Organization of the Revised IJC Structure

General

Having identified the basic characteristics and functions of the postulated institutional structure, the task is now that of fitting the pieces together into a specific institutional proposal.

To start, this matter of designing an international management arrangement for the Great Lakes region should be put in correct perspective. It has already been recognized that a complete international institutional arrangement encompassing the full range of desired management functions could not likely be created at the outset - only five of a potential fifteen possible areas of concern (identified in Chapter I) are initially proposed as direct functional responsibilities for the new office. It would be ingenuous to suppose that all of the concepts, characteristics, criteria, and functions discussed in previous sections could be directly incorporated into a full-blown management arrangement. While the tenor of this investigation is in terms of an ideal arrangement, it is recognized that the incremental approach is the preferred way of

doing things in this world. This acknowledgement is further tempered by a graceful (albeit reluctant) acceptance of the inevitability of sub-optimization in nearly every human endeavor. With these caveats now on the record, we feel somewhat less vulnerable as we describe our approach to organizational design as that of an incremental development which moves toward, and approaches as a limit, the maximum of political acceptability.

While recognizing the reality of "incrementalism," tokenism must be guarded against. Early substantial revision of present institutional arrangements, centered on the IJC, is advocated. The institutional model is developed in two stages or phases.

The Phase I arrangement is envisioned as the next step which might be taken by the two governments. Phase II identifies a more complete institutional rearrangement and is offered as an eventual goal for Canada and the United States in providing for effective resource management in the Great Lakes Basin. The first stage reorganization plan entails significant but less dramatic changes than those embodied in the more structured Phase II proposal, its principal purpose being that of getting the overall reorganization process underway.

The joint policy formulation, information collection, research, planning and general management operations outlined in the first part of this chapter would be fully developed in Phase II. Phase I will incorporate each of these desired features, but they would be less completely developed. The five special areas of concern: air quality, fishery management, lake level control, navigation and water quality are included in the Phase I plan to set the framework for possible full development in the Phase II organization. In both phases, the IJC's boundary water responsibilities outside of the Great Lakes Basin would remain unaffected.

Organization charts are used to introduce each phase as a means of lending clarity to the text. They serve an illustrative purpose; the actual structural and administrative details could take any number of different forms. For this reason the reader should focus on the concepts introduced and not be unduly concerned with how the lines may be drawn on the organization charts.

Phase I

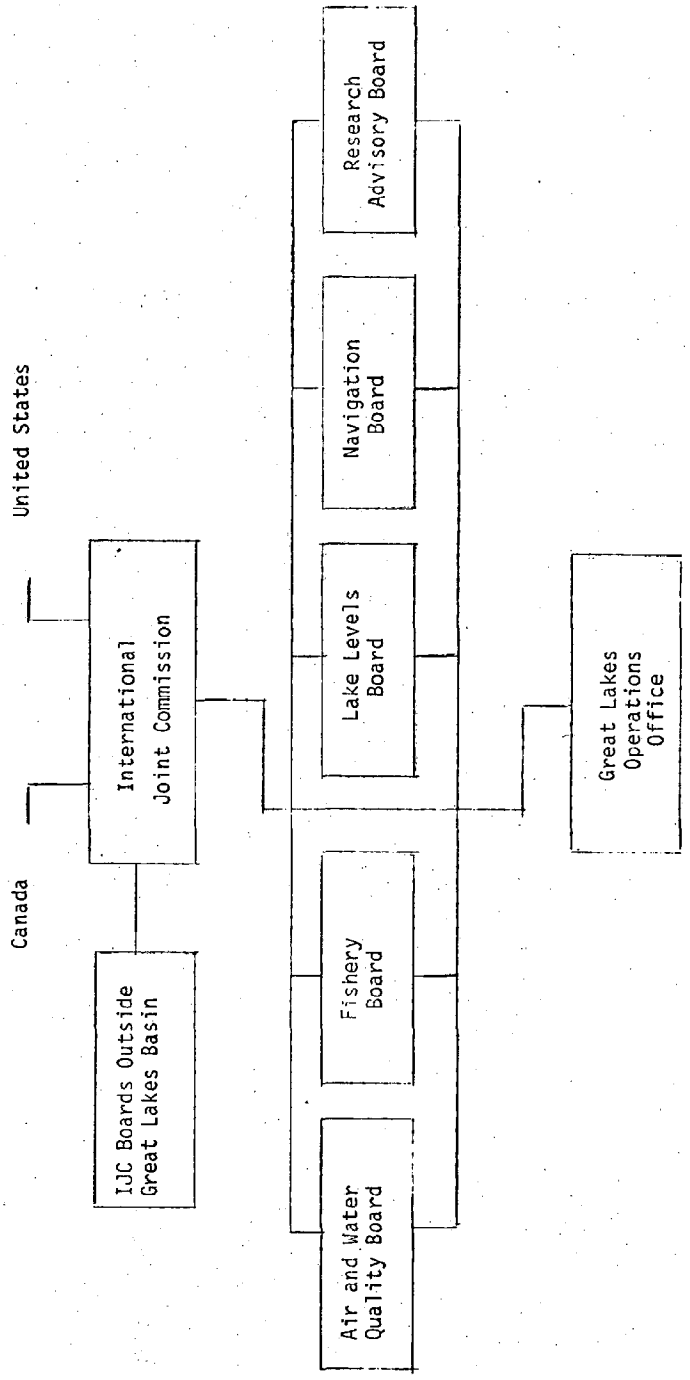
In Phase I, the scope of IJC responsibilities would be significantly broadened to ensure the comprehensive character and viewpoint required for a more rational management of the resources of the Great Lakes. This can be accomplished while at the same time preserving useful features of the existing IJC structure. For example, the present IJC joint board concept might be adaptable to our present purpose. In our model, existing boards directly concerned with air and water pollution are to be combined into a single board; boards presently involved in control of, or studies on, lake levels and flows are to be merged into one board; the fishery and the navigation boards are the only really new additions. These five boards would bear the primary responsibility for technical advice to the IJC/Great Lakes Operations Office structure. The Research Advisory Board is to be a more broadly based version of the board of the same name set up under the Water Quality Agreement, but presently limited to dealing with water quality research only.

In Phase I, the Great Lakes Operations Office would constitute the most important new feature of the revised IJC structure. The Operations Office is that element to be charged with overall responsibility for

implementing the IJC's new treaty mandate in the Great Lakes Basin. It is presently represented in embryonic form by the recently established Water Quality Office. A substantial restructuring of the present boards and formation of the Operations Office would obviously necessitate major adjustments in the Commission, including a buildup of its central staff.

The basic functions that were discussed in the first part of this chapter would be carried out through a combined effort of the Commission, the Operations Office and the five functional boards shown on the chart. The basin-wide policy guidance activities would be a primary function of the Commission. Development of a information system would be assigned the Operations Office. The coordination and guidance of Great Lakes research efforts would be the basic task of the Research Advisory Board. Coordinated planning, including initial development of a comprehensive framework plan, would be centered in the Operations Office with Commission direction and board support. Operational coordination, focusing on the administration of joint programs in the five key management areas, as well as support of the policy-making, information, planning and research functions of the other units, would rely heavily upon the individual boards for their specialized guidance with administration and reporting requirements accomplished by permanent staff of the Operations Office.

The Commission, together with certain senior level officials of the five functional boards and of the Operations Office, would make up what could be referred to as the "Great Lakes policy unit." The purpose of this group is to accomplish policy coordination of the nature described in the first part of the chapter under "Basin-Wide Policy Guidance."



Proposed IJC Great Lakes Arrangement
Phase I

The Commission would assume an active, guiding role in this area. In order for the Commission to properly assume such a role, a number of modifications must be made to match its capabilities with the broadened responsibilities.

Foremost, the IJC must be released, at least in the case of its Great Lakes jurisdiction, from the present treaty constraint of acting only when a matter is referred to it by both countries. The IJC should be allowed the initiatory authority needed to identify and address in a prompt manner emerging problems and to bring them to the attention of the two governments and the public in advance of crisis, rather than subsequent to it. The authority to create new technical boards or working groups in addition to the five initial boards, should also be a feature of the IJC's initiatory capabilities. As the focal point of Great Lakes policy coordination, the IJC should participate in those national and state/provincial policy planning processes that affect to a significant degree the resources of the Great Lakes, contributing its "Great Lakes view" to these processes. In the five special areas of concern considered particularly important to the future of the Great Lakes, the IJC should be given an active part in coordinating bilateral policies and joint programs, as mutually agreed, extending somewhat the principles initiated under the Water Quality Agreement. The IJC should also be allowed as much latitude as possible in formulating policies to establish new programs and administer its basic programs. In regard to areal jurisdiction, Lake Michigan and its drainage area should formally (by amendment to the 1909 Boundary Waters Treaty) be included within the international Great Lakes Basin.

The responsibility of providing policy guidance to the activities related to the development of a comprehensive framework plan and the creation of a Great Lakes information system and research program, through its new subordinate units, would require the Commission's continued attention. It is apparent that the total workload of the Commission and the demands on its immediate staff would be considerably greater than at present. Therefore, it would be imperative that a number of structural and administrative changes in the Commission accompany the increase in responsibilities.

International Joint Commission

The IJC would undergo the following modifications:

1. The present membership of the Commission would be increased from six to eight, four from each country, with all commissioners (not just the co-chairmen) accorded full-time status.

2. The commissioners would be appointed to fixed terms, staggered to ensure that there are at least two experienced commissioners from each country serving at all times. The commissioners would still be appointed by their respective chiefs-of-state, however, their appointments should be subject to confirmation in the appropriate manner by their respective national legislatures. The positive role which is to be assumed by the IJC should be an important criterion in selection of the commissioners.

3. The Commission sections would need to be provided additional staff to carry out their new functions. Creation of a central binational staff to support the Commission's Great Lakes functions might be considered. This would be in addition to the staff of the Operations Office.

4. The IJC should be empowered to hold hearings on all matters within its purview, not just on those matters which happen to be referred to it by the two governments. At the same time, the IJC, primarily through the Operations Office, should assume the responsibility for keeping non-government as well as government interests impartially informed on Great Lakes natural

resource-related matters as appropriate. This could involve less formal, regular public information meetings at selected locations around the Basin, similar to those now being conducted by the U.S. Great Lakes Basin Commission in connection with completion of its Great Lakes Basin Framework Study. The Great Lakes boards should also be allowed to hold public hearing for their studies.

5. The IJC should be provided ready access to the court systems of both countries in enforcement cases, as appropriate, and other matters that may arise from operations of the Operations Office and the Great Lakes boards.

The Great Lakes Operations Office

The policies and programs developed by the IJC, which would presumably be within that body's treaty terms of reference with regard to improved resource management in the Great Lakes Basin, would be carried out by the Great Lakes Operations Office. The Office would be a full-time operation with permanent facilities situated near the geographical center of the Basin, likely in Windsor, Ontario, where the IJC's Water Quality Office is now located. This would be a jointly staffed office with half of the supervisory and supporting staff drawn from each country and directed under arrangements agreed upon by both countries.

As previously indicated, the primary function of the Operations Office would be to administer IJC-directed resource management activities within the Great Lakes region. This would call for close ties between the Office and the Great Lakes boards. Accordingly, each board could be assigned Office personnel, knowledgeable in that board's specific operations, to act as a secretariat handling the professional and supportive tasks connected with implementing, coordinating and reporting on board activities. Each board would have the delegated IJC responsibility for continuing joint programs in its field, e.g., the fisheries board would direct the

lamprey control programs as had been done by the GLFC; the lake levels board would be directing all of the regulating activities for Lakes Ontario and Superior. The Operations Office staff would also assume the related administrative tasks of assembling the technical data and information generated within the board, for continuing appraisal of the ongoing joint programs. Such arrangements should: (1) allow the board members more time to devote to their substantive tasks; (2) form a more positive link between the boards and the Commission than presently exists; and (3) streamline each board's operations by administratively reducing the time formerly required to prepare board reports and to implement recommendations.

In addition to its functional relationships with the boards, the Operations Office would assume responsibility for developing a complete information collection and dissemination system in consonance with the format described in the first part of this chapter under the heading: "Coordinated Information System." Recall that a related task would be maintaining a Great Lakes public information program open to two-way exchanges of information on the Great Lakes Basin matters.

The remaining major function of the Operations Office is that of coordinating comprehensive basin-wide resource planning. A basic purpose of this planning function would be to integrate the inputs of all interests and their activities affecting the Great Lakes into an acceptable bilateral framework plan which, once developed, should guide the programmatic planning of the existing governmental agencies with resource-related missions in the Great Lakes region.

With respect to the general functional task referred to earlier as: "Coordinated Planning," the United States through its Great Lakes Basin

Commission (GLBC) has a framework plan underway for the United States portion of the Great Lakes Basin. Under the Canada Water Act, Canada could set up a similar mechanism to plan for that portion of the Basin. However, what is really called for is a combined (international) planning function, i.e., the GLBC and a Canadian counterpart merged into a unified planning effort. This is not meant to imply that the bilateral planning effort should or need wait until a Canadian counterpart to the GLBC has been created, for it would be preferable to go directly into the international scheme.

The Great Lakes Basin Commission's Framework Study does provide the base from which to expand into a truly basin-wide plan. Accordingly, it is proposed that the GLBC, its staff and library of materials, be incorporated into the Operations Office as the nucleus of the United States complement of the binational planning staff. The GLBC contacts and experience in preparation of its framework study for the United States segment of the Great Lakes Basin would be definite assets in the formation of a bilateral planning group. Unilateral continuation of the GLBC or any Canadian counterpart would be pointless and might in fact deter the joint planning effort.

The planning unit within the Operations Office would be called upon to recommend long-range schedules of priorities for the collection and analysis of data. This unit would lay out for the high level decision-makers in the IJC (the Commission) and the two governments, alternatives for proposed development and solution of system problems based on comprehensive, basin-wide considerations. Overall, the planning unit of the Operations Office would play the key role in keeping the IJC's total and impartial "Great Lakes viewpoint" in step with the basin-wide developments.

The Great Lakes Boards

International boards would remain the essential technical units of the IJC's Great Lakes arrangement. The desirability of designating five resource problem areas (air quality, water quality, fishery management, lake level control and navigation) as the initial set of problems to receive special attention has already been discussed and therefore will be generally assumed at this juncture. Some additional details on what the creation of each of the five Great Lakes boards involves, follow.

Air and Water Quality Board. The 1972 Water Quality Agreement authorizes to be established a single Great Lakes Water Quality Board having representation from state, provincial and federal agencies, departments and ministries. For air pollution matters there are two existing boards: the International St. Clair-Detroit Pollution Board and the International Air Pollution Advisory Board. However, consideration of Great Lakes air quality and water quality matters would seem best accommodated as a common board effort in the IJC's new Great Lakes arrangement.

There are a number of similarities in air and water pollution control problems wherein analogous procedures could be employed to coordinate common programs being administered, for the most part, by the same agencies in both countries. Also, the pervasive nature of air pollution suggests that it be considered in the broadest available forum. The Water Quality Board, the largest of all IJC boards with representatives from both federal governments, the Province of Ontario and all eight Great Lakes States, provides this broad forum.

While water quality concerns can be expected to demand the greater attention for some time to come, the merger of air and water concerns

should not hamper specific consideration of either air or water quality problems. Air quality problems should also receive the broad attention accorded water quality problems by the Water Quality Agreement. Subjecting air quality matters to the scrutiny of the same broad forum should achieve this purpose. If there is difficulty in the idea of selecting a single state representative for air and water quality matters, alternate representatives could be used.

Fishery Board. The Great Lakes fishery is an important and essential element of the proposed resource management arrangement. It must have the authority to address fishery concerns and to include fishery interests in its planning and policy guidance activities if it is to have a valid claim to comprehensive and integrated management of Great Lakes resources. The Great Lakes Fishery Commission (GLFC) is an autonomous body, created by treaty between Canada and the United States to carry out long-term planning and undertake certain programs for the improvement of the Great Lakes fishery.[9] Technically, it is coequal to the IJC although its treaty mandate is strictly limited to fishery concerns. There appear to be two ways to resolve the problem. First, a liaison procedure could be established between the GLFC and the Great Lakes Operations Office. The success of this alternative would depend on the ability to maintain close and direct contact between the two agencies. Second, the GLFC would be abolished and its responsibilities, authorities and programs merged into a separate Fishery Board within the IJC arrangement. In our judgment, a liaison procedure, no matter how earnestly applied, is a poor substitute for the inherent advantages of outright union and a high price to pay to preserve the integrity of the GLFC. Any attempt to have

it both ways can only undermine in the long run the capacity of both organizations to meet their assigned responsibilities. There appears to be little advantage in keeping the central focus of fishery concerns outside of the proposed comprehensive policy, planning and research efforts of the IJC's Great Lakes structure.

It is therefore proposed that the implied amendments to the 1909 Boundary Waters Treaty provide also for the transfer of the Great Lakes Fishery Commission to the new Great Lakes arrangement. The GLFC would thus form the proposed Fishery Board. The present commission members could be named to head up the Board. Former GLFC staff personnel would serve with the Fishery Board or with the Operations Office. The transfer en masse of the GLFC has the added advantage of preserving the trust, good will and other working relationships that the Commission has established with other agencies over the years. In addition, the merger of the GLFC with the IJC arrangement would provide fishery managers of both countries direct and convenient access to the full range of available Great Lakes data and information, which, from indications, is not the present case.

The GLFC-IJC merger is one of the most striking proposals made for the Phase I reorganization. Amendments to two existing treaties would be involved. The negotiation of these amendments need not necessarily encounter insuperable difficulties as long as they are conducted by both parties in a spirit of doing what is best for the long-term interests of the Great Lakes region.

Great Lakes Levels Board. This board would naturally evolve from the present International Great Lakes Levels Board in combination with

the other IJC control and advisory boards concerned with levels and flows. The resulting single board would then encompass the functions and responsibilities of the Great Lakes Levels Board and the remaining boards, namely, the International Niagara River Board of Control, the International St. Lawrence River Board of Control, the International Lake Superior Board of Control and the American Falls International Board.

As for the other Great Lakes boards, the Operations Office would provide administrative support thereby eliminating the need for board committees such as the report committee of the present Great Lakes Levels Board. The exchanges of data and parallel calculations now handled in the agencies of the control board members could also be assumed by Operations Office staff assigned to the new central lake levels board. Overall efficiency and effectiveness should be improved while relieving the supporting agencies of their relatively rudimentary-type, board related tasks.

There are three international groups presently outside of the IJC board system that are also closely involved with Great Lakes lake levels matters. These groups are the International Niagara Committee, the Coordinating Committee on Great Lakes Basic Hydraulic and Hydrologic Data and the Great Lakes Study Group. It would be proposed that the materials, studies and general activities of these three groups be incorporated into the central Great Lakes Levels Board, the Research Advisory Board and the Operations Office, as appropriate. A number of loosely-knit groups collecting and generating data would tend to detract from any central effort. If the more meaningful comprehensive central information and research efforts of the Operations Office and the Great

Lakes boards are to be successful, the primary users and generators of Great Lakes data and information, now enlisted in the above mentioned informal coordinating groups, should support use of, and thereby rely upon the IJC's central system. Bilateral agreements covering the IJC's new Great Lakes management role could direct federal agencies and departments to use and contribute to the IJC central information system and research efforts in lieu of continuing support of diffuse, special interest efforts. This would facilitate the IJC's Great Lakes function and provide better service to the agencies and departments than now exists due to the lack of an adequate central information arrangement.

Navigation Board. As discussed in Chapter I, there is no existing Canadian-United States body specifically focusing on the many aspects (economic, environmental, social) of Great Lakes navigation concerns. The proposed Great Lakes Navigation Board would assume such a role, formally integrating navigation interests and issues with the other natural resource related concerns of the Basin. The Navigation Board could evolve, at least in part, from the Navigation Committee of the present International Great Lakes Levels Board. A conclusion of the GLBC Framework Study on navigation was that "continued study of traffic growth and traffic patterns, technology and competition is necessary in planning for Great Lakes navigation."[10] Such input should properly be included in the contemplated comprehensive planning effort of the IJC arrangement. The Navigation Board is needed to give specific attention to keeping abreast of such matters through direct contacts with both government and nongovernment navigation interests in both countries. Again, according to the GLBC, "the future improvements of the Great Lakes-St. Lawrence

Seaway are to a large degree dependent on the probable legislative attitude of both countries, toward the need for a vital waterway system, the regulation of transportation by both governments, and the toll system and legal and tax structures."[11] For the IJC to assume a meaningful role in identifying potential common objectives and recommending joint policy, such navigation related issues must be accounted for. The Navigation Board would provide the needed special assistance to properly advise the Commission and thereby give to navigation issues the specific bilateral attention which these large-scale concerns merit.

Research Advisory Board. As noted previously, the proposed Great Lakes research advisory board (GLRAB) is conceived as an extension of the present Research Advisory Board created pursuant to the 1972 Water Quality Agreement. Specific functions and responsibilities applied on a comprehensive scale would be consistent with those specified in the agreement for establishment of the water quality Research Advisory Board. These are:

> (a) To review at regular intervals these (Great Lakes Basin) research activities in order to:
>
> (1) examine the adequacy and reliability of research results, their dissemination, and the effectiveness of their application;
>
> (2) identify deficiencies in their scope, and inadequacies in their funding and in completion schedules;
>
> (3) identify additional research programs for which international cooperation will be productive;
>
> (4) identify specific research programs for which international cooperation will be productive;

(b) To provide advice and consolidations of scientific opinion to the Commission and its boards on particular problems referred to the Advisory Board by the Commission or its boards;

(c) To facilitate both formal and informal international cooperation and coordination of research; and

(d) To make recommendations to the Commission.

The GLRAB would be made up of Commission appointed government members, academics, professional researchers and scientists with individual qualifications suited to the tasks of the board. A principal task of the board would be a comprehensive review of the state of knowledge on Great Lakes resource matters pertinent to adequately understanding, and thereby better managing, the overall system. This would require an intensive study by the best qualified individuals available for this task. For this initial review effort, it would be advisable that personnel from the Operations Office be detailed to the GLRAB on a full-time basis.

The GLRAB would be administratively supported by the Operations Office, as in the case of the other boards. There would necessarily be a close interface with the information center of the Operations Office and it could be expected that the GLRAB's contribution to the Commission's Great Lakes planning and policy formulation roles would be substantial. Regular exchanges with governmental and intergovernmental groups, universities and private research organization could be expected as necessary for the board to carry out its responsibilities.

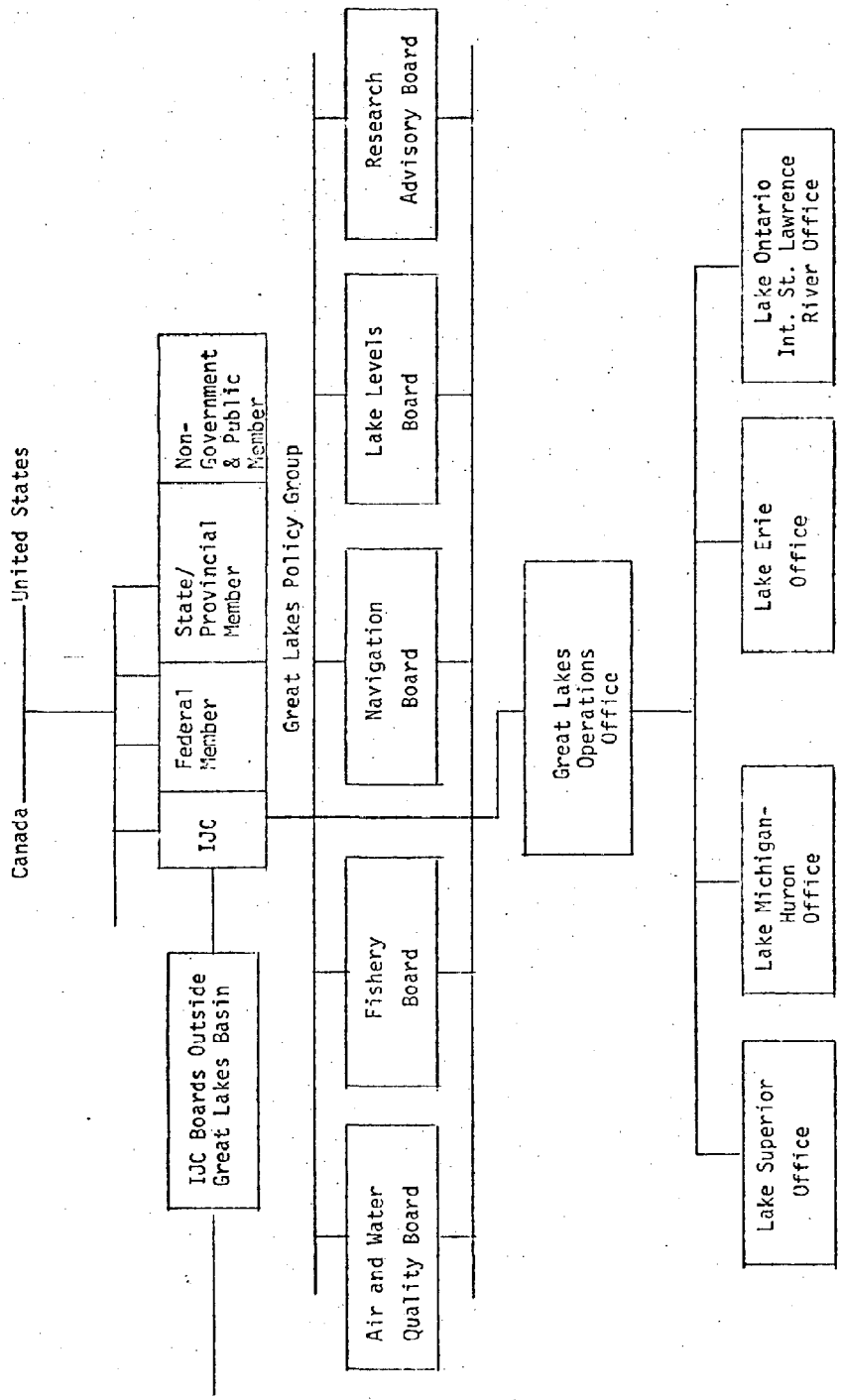
Phase II

Phase I is a critical phase that is concerned primarily with matters of reorganization and the development of a Basin Plan. In order to allow

these essential preparatory activities to proceed as smoothly as possible, it will be necessary to grant the new IJC arrangement the maximum freedom of action consistent with treaty and other mutually agreed upon constraints during that phase. It is for this reason that no formal provision was made in Phase I for direct participation by the states, provinces, metropolitan centers, nongovernmental organizations and citizens of the region. This deficiency is corrected by Phase II with the creation of the Great Lakes Policy Group (PG) and the lake basin offices. Refer to chart - Phase II.

It was considered more important to get the ship safely launched before loading it down with all its cargo. Stated another way, only when the new arrangement has completed its reorganization and has carried forward the Basin Plan to advanced states of completion will it be adequately prepared to mediate the interests of the large number of groups concerned with one or more aspects of resource-use in the Great Lakes region. A mechanism must be provided, at the appropriate time, to accommodate the views of these concerned interests.

As a matter of fact, Phase I is not devoid of this capability; it merely relegates the matter to one of secondary priority for the reasons already stated. The Policy Group is already in gestation in Phase I in the form of the Great Lakes policy unit, a label applied to the IJC and policy level officials of the five boards and the Operations Office. Accommodation of interests would be a major concern of the Phase I policy unit. In Phase II, however, the policy unit undergoes a metamorphosis, becoming the Great Lakes Policy Group.



Proposed IJC Great Lakes Arrangement
Phase II

Great Lakes Policy Group

The Great Lakes Policy Group (PG) is conceived as a joint Canadian-United States body which in Phase II would assume the IJC's mediation, policy-making and general supervisory functions of Phase I. The Commission would play a central role in the Policy Group and it would retain its treaty responsibility as the official conduit for recommendations to the two governments. The IJC would continue to serve in its role as advocate for what is best for the Great Lakes as a whole. While under the Phase II model the IJC shares in a formal manner its policy-making authority which it previously exercised without significant external influence, this new state of affairs need not constitute a threat to its hegemony or the integrity of the organizational arrangements developed in Phase I. It all depends on how well or how badly the enabling treaty amendment is drafted. This task is perhaps the most important and most crucial aspect of this entire project. The challenge is that of striking the correct balance between two very essential needs: (1) that of providing an open forum at the policy-making level for all concerned governments and private sector groups and (2) that of preserving unified IJC leadership to the five boards and Operations Office in order to achieve the desired Canadian-United States coordination of policies and programs in the Great Lakes.

An amendment to the 1909 Boundary Waters Treaty would be required to establish the Great Lakes Policy Group and to define its membership, functions and decision rules. The PG should provide for representation from federal, state and provincial governments as well as concerned

public interest groups. Special interest groups representing directly or indirectly profit-making organizations should not be represented on the Policy Group.

Decisions bearing on who is to be represented and in what numbers can be very difficult. The total number must be kept within reasonable limits. For the present purpose, let us suppose that nine representatives from each country is the limit that is established.

The nine representatives from the United States might include one IJC representative, two federal representatives, three state representatives, one metropolitan area representative, one nongovernmental organization representative and one public member. The Canadian representation could be very similar with the exception that Ontario Province would have three representatives as counterparts to the three state members from the U.S. side. Since there are eight states in the Great Lakes Basin, a rotation arrangement could be worked out in order to insure representation from all Great Lakes states. Moreover, having eight states share three representatives could promote greater interstate communication and co-operation during the crucial early stages of the Great Lakes policy formulation process. The Great Lakes Commission, which is an interstate group established in 1955 under a Great Lakes Basin Compact, could serve as the forum for selecting the three state representatives.

The terms of all Policy Group representatives (with the possible exception of state members) should be set at a four year minimum. All decisions would require a simple majority vote by the policy unit members, without reference to nationality.

Lake Basin Offices

In Phase I an Operations Office and a series of functional boards were established to achieve the integration of programs in the Great Lakes Basin as a whole. In Phase II, the complement of this structure focusing on matters of basin-wide concern is created in the form of lake basin offices with more specific or localized concerns. They are set up to address the special problems of the individual lake basin. The lake basin offices are linked to and are extensions of the Operations Office. Each of the four basin offices would be located at points in the particular lake basins considered most suitable by the Operations Office with the approval of the Great Lakes policy unit.[12] Another principal function of the lake basin offices would be to provide for closer coordination of programs within the IJC's terms of reference. The existence of such offices would also enhance the surveillance capabilities of the new organization and would provide local points of contact with the public. The lake basin offices are the international version of Craine's "Regional Resource Management Agencies" which also would operate under and as extensions of policy parameters established by U.S. Great Lakes policy agency. The major difference between the two similar basin agencies is that in Craine's model the agencies would have (and indeed could have in a national scheme) specific water resource management authorities, such as information collection, regulation, program incentives and project design, financing, construction and operations. Still another difference is that the lake basin offices would have responsibility for the full range of Basin resource problems, whereas Craine's concept was limited primarily to water resource problems.[13]

Fiscal Implications

Both the Phase I and Phase II plans outline a significant expansion and extension of the IJC's role in natural resources management for the Great Lakes Basin. A full-time Commission, a larger central and a regional staff, and new functions and tasks are envisioned. In short, there are immediate implications for financing and administering this new arrangement. Serious consideration should be given to a joint funding system centrally administered by the IJC.

A coordinated budget request for the United States share of the total IJC commitment would be a primary requirement. Recall that the preceding proposals involve not only the IJC but organizational incorporation of the GLFC and the GLBC. In the United States, the FY 1973 federal budget for the United States share of the GLFC was approximately $1,850,000 (as compared to the IJC's $525,000).[14] The FY 1973 federal budget for the United States GLBC was $400,000; however, there is also a considerable total state contribution which would properly become a federal cost under the IJC/Operations Office plan.[15] The overall funding system in the United States would become even more haphazard with the proposed mergers; the practicality of continuing such a system, without adjustments, is questionable at best.

It is suggested that, as a minimum, the United States total budget share for the new arrangement could be coordinated through the Water Resources Council similar to the present procedure on Federal funding for the United States GLBC. A further improvement would be to have the United States Section of the IJC solicit the funding needs of the cooperating agencies and departments and submit a single budget for review by a

single appropriations committee. This would be a subject for one of the appropriations committees dealing regularly with natural resources and/or environmental protection matters, e.g., public works committees and not the State Department appropriations committees, once the enabling bilateral agreements had been co-ratified.

Canada appears to have a more positive IJC funding process than the United States; however, that government should favor any change that improves the overall (international) funding picture. The preferred approach might then be to have fully integrated joint budget with both countries contributing equal shares for binational use.

A joint budget would best serve the need of the proposed arrangements for an assured minimum level of funding for direct administrative and study costs. The minimum funding support levels could be spelled out in the organizational agreements. Funds for the technical studies could be readily distributed to the cooperating agencies and departments in each country with simple, inter-agency agreements.

REFERENCES AND FOOTNOTES - CHAPTER II

[1]Roy F. Weston, Frank J. Trelease, Leonard B. Dworsky and Loring F. Oeming, "Water Quality Management - Legal, Technical, and Administrative Aspects", in Water Pollution Control Federation Journal, Volume 36, No. 9, September 1964, p. 1092.

[2]National Environmental Policy Act of 1969, January 1, 1970; PL 91-190; 83 Stat. 852.

[3]Okanagan Basin Study - Information Brochure, prepared by the Okanagan Study Committee, Canada - British Columbia Okanagan Basin Agreement, January 1971, p. 1.

[4]Canada Water Act of 1970, Can. Stat. c. 52 (1969-1970).

[5]E. Roy Tinney, "The Canada Water Act - A Vehicle for Action", in Optimum, Bureau of Management Consulting, Ministry of Supply and Services, Ottawa, Vol. 2, No. 1, 1971, p. 42.

[6]Id. p. 39.

[7]Water Resources Planning Act of 1965, July 22, 1965; Public Law 89-90; 42 U.S.C.A. 1962 through 1962d-3. The GLBC was established by Executive Order No. 11345 on April 20, 1967 (32 F.R. 6329).

[8]Lyle E. Craine, Final Report on Institutional Arrangements for the Great Lakes, a report to the Great Lakes Basin Commission (GLBC), March 15, 1972, p. II-2.

[9]Convention on Great Lakes Fisheries, September 10, 1954; 6 UST 2836; Act. II.

[10]Great Lakes Basin Commission, Great Lakes Basin Framework Study, Appendix No. 9, Navigation, Volume 1, Draft No. 1, January 1971.

[11]Id.

[12]One lake basin office is suggested for Lakes Michigan and Huron since they are hydrologically the same basin.

[13]Craine, op. cit., pp. IV-(6-8).

[14]The Budget of the United States Government, Appendix, FY 1973, p. 675.

[15]Id., p. 976.

CHAPTER VI

A GREAT LAKES BASIN INFORMATION SYSTEM*

Introduction

The previous chapter described a possible joint Canadian-United States body to enhance binational coordination on the Great Lakes and to promote a comprehensive approach to Great Lakes resource management. These objectives clearly imply the need for a carefully designed information collection and processing system to provide the scientific and technical information required by the new joint organization as well as concerned domestic agencies. Two points must be emphasized. One, the overall effectiveness of the new organization will depend directly on its information system. Two, the system must be devised in such a way that it does not overlap the work of existing domestic systems but rather, that it ties such domestic information collection efforts together and that it identifies gaps in the total collection effort. This chapter is concerned with such an information system. The treatment is in four parts. First, there is a brief review of the general functions of information systems. Second, there is discussion of the perceived information needs of the proposed new organization. Finally, in two separate case studies, two areas of information needed by the proposed joint organization, specifically, economic development and water quality, are considered in detail. Inasmuch as the original research for these case studies was confined to the Lake

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*This chapter and the two case studies appended are based in part on a master's thesis by H. Dale Reynolds entitled, An Information System for the Management of Lake Ontario, Cornell University, 1973.

Ontario Basin, that geographical focus is retained without attempting to expand the scope to the entire Great Lakes Basin.

Information and Information Systems: Definition

There are many ways to define information. For the purpose of this discussion, information is considered synonymous with knowledge or intelligence. One student of information theory, Perry Rosove, describes information as "an aggregate of facts so organized or a datum so utilized as to be knowledge or intelligence. Information is meaningful data, whereas data, as such, have no intrinsic meaning or significance."[1] Another way of stating it is that information is data or observations so arranged as to be of value in decision-making.[2] The distinction between data and information illustrates an important aspect of information which is stressed in this discussion and that is information is oriented toward the use of the data rather than the mechanics of data collection and storage as such.

An information system, as defined by Rosove, is "the formal or rationally planned means whereby (users) receive and transmit information."[3] It is more than a data processing system, although this may be an important aspect of an information system.

The main concept of an information system is that it must be user oriented. In the area of urban planning, there has been considerable experience with data banks, most of which has been disappointing.[4] Data were included in the system because they were available, because they were presently used, because people said they needed them, or all of these. The key criteria - organizational decision and operations requirements and their information needs - simply were not included. The result was the creation of a data bank which was not used.

This fault seems to exist in many information systems. Too little attention has been given to the need to provide information in those forms and formats in which it is needed by its users.

The Organization for Economic Cooperation and Development (OECD) published a report entitled: Information for a Changing Society, which addresses the problem of information use.[5] Certain themes run throughout this report: (i) various types of information are needed for decision-makers at all levels throughout society; (ii) information must be appropriately packaged and interpreted for each specific community of users; and (iii) quality of information--that is, its reliability and credibility--is more important than access to great masses of raw data.[6]

There is, of course, nothing profound or novel about these ideas. But this approach does differ greatly from the usual approach to information systems, where the emphasis is primarily on accessibility to great masses of information and on the technology of manipulating such masses, with less thought given to the quality of the data or its usability by potential users.[7]

This emphasis on users of the information brings out an important organizational point. An organization is composed of different users of information. All aspects of management, from high level policy decisions down to routine day-to-day operation, depend on information flows. The information system is analogous to the central nervous system of an organism that coordinates and controls the various components and forms a whole. The information system is an integral and essential part of all the management activities and must not be looked upon as a separate organizational unit which only provides input. The design of the system

cannot be relegated to a certain group such as a data processing section or to information specialist consultants but must be an integral part of organizational design, involving the highest levels of management and planning. The information system, may very well be one of the most important determinants of both the organizational structure and its manner of operation.

One aspect of organizations which can be greatly affected by the information system is the degree to which control is centralized. In the past, as organizations have grown large, the trend has been toward decentralization. However, this has been a mixed blessing and has led to duplication of jobs and functions and the establishment of local goals that may not be consistent with those of the organization as a whole. Problems of information have been created by its dispersion in many separate files and the delay in its processing and transmittal to the higher levels of decision-makers. A centralized computer-based information system can correct many of these problems. The centralization of information may or may not lead to centralization of control. This is a moot question; the important thing is that it can streamline operations and give the organization a new coherence and sense of unity.[8]

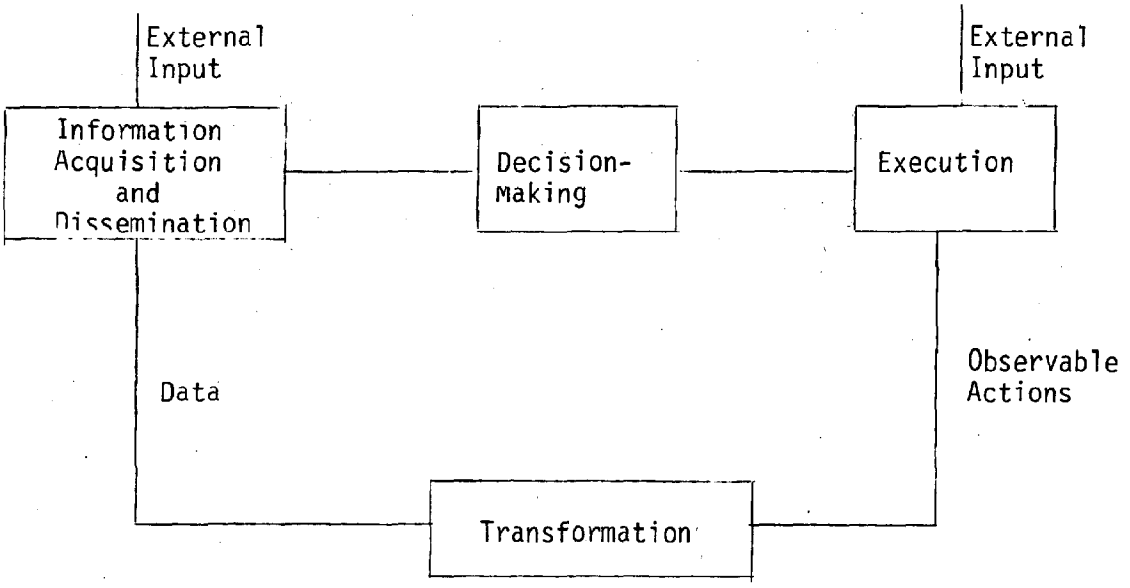
Information systems are customarily broken down into two broad categories "hardware" and "software." "Software" is a term about which there is no consensus on meaning. It is often used to refer exclusively to standard computer programs provided by computer manufactures. A more general definition would be everything about the system which is not "hardware." This discussion will be concerned with the "software" of information systems, in the more general context. The focus will be

on information needed, sources of this information, identifying the users of the information, and developing an analytical framework for its use.

Generalized Information System Model

Yovits and Ernst have proposed a model of information systems which has general applicability.[9] They suggest that this model applies to any situation involving the flow of information, from the management of a complex organization to the simple switching on or off of a thermostat-furnace system. The four essential functions include : information acquisition and dissemination (IAD), decision-making (DM), execution (E), and transformation (T). The system is shown in figure 1. The model applies even when decisions are irrational, or without logical or analytical bases.

Figure 1 Generalized Information System Model



The DM function is the key consideration in the entire information flow process. It may be an individual or an organization, a man-machine, or machine system. The DM is responsible for generation of observable actions. Without the generation of observable action, the system has little or no physical meaning, and would have little point for existence. The observable actions are measurable, physical quantities other than information.

The feedback loop is a significant point. It always exist but often is not explicit and is not adequately considered in most presently designed "information systems." The closed loop is accomplished by the transformation of observable actions into data by measuring devices. It is important to note that the observable actions are physical in nature but are not information and cannot be utilized for decision-making without first being transformed into information. This distinction may be obvious but it is not trivial and is important to the structure.

Information supplied to the DM from the IAD is of three basic types. There is information from the feedback loop obtained by the transformation of observables into information. There is also information from the external environment over which the decison-maker has no control. Thirdly, there is fundamental information that the decision-maker may use such as tables, mathematical and physical constants, and lawful relations.

The DM function operates by the use of a predictive model which it believes will transform the information received into the appropriate observable action. The predictive model may be accurate or incorrect, logical or illogical. Part of the purpose of the feedback is to determine the accuracy of its model. The DM may alter its actions based on the

predictive model as further information becomes available from external sources or from the transformation of resulting observable action. Also, the DM may develop new predictive models as further information becomes available.

The DM disseminates courses of action (results of decisions) communicated to the E function which transforms decisions into observable action. Perturbations from the external environment enter into the execution function and are mainly responsible for the inherent uncertainty of transforming information into action.

The IAD function, or more accurately, information acquisition, storage, and dissemination, is frequently referred to as an information system. However, this is only a component of the total closed system as shown in the figure . The IAD collects the three basic types of information supplied to the DM as discussed previously. It stores a data base and, moreover, operates on the data and stores it in different ways. Some of the typical and most important operations performed on the data include:

a. restructuring

b. filtering or weighting

c. selection and rejection

d. analyzing

e. sequencing or ordering

f. prediction

g. display

Finally, the IAD disseminates data for use by the decision-maker. This dissemination may be passive or there may be active interaction between the DM and the IAD.

Developing an Information System

In the development of a large scale information system, there are five sequential stages or phases which must be considered.[10] These stages are:

Phase I - Requirements

Phase II - Design

Phase III - Production

Phase IV - Installation

Phase V - Operations

We will be concerned primarily with Phases I and II, requirements and design, since these are concerned primarily with "software."

Requirements Phase. The requirements phase is concerned with determining what the system is to do, as opposed to the design phase which is concerned with how it is to do it.

In determining what a system is to do, the following types of questions arise: "Why is the system needed? What is its purpose or purposes? What is it expected to do? What problems is it supposed to solve? Who are the system users? What are their objectives? What preliminary qualitative and quantitative requirements for the system can be inferred from the users' objectives?"[11]

The primary objective of the requirements phase is to identify the users and their objectives and determine how the information system can help them meet these objectives. This sets the goals to be accomplished by the design phase.

Design Phase. The major objectives of an information system are to bring "relevant data and usable form to the right user at the right time."[12]

In carrying out the design phase, the elements of the system must be identified and characterized. The relationships between these elements are as important as the elements themselves and must be considered in the system design.

Some of the important elements of an information system are as follows:[13]

Data

Personnel

Display

Equipment (i.e., input, output, transmission, processing, and storage)

Retrieval

Programming

a. Data. Data are obviously the most basic consideration of an information system. There are several important attributes of data to be considered, including their relevance to a particular task or tasks, degree of specificity (i.e., amount of aggregation), sources, destinations, and the amount of processing. The processing of data may involve simple logical examination, such as sorting and validating, some type of mathematical analysis, or simply passing it through with little change.

b. Personnel. People are an integral part of an information system. They not only use outputs from the system but are components themselves and often supply information input to the system. Human actions which are a part of an information system include--monitoring, comparing, assessing, predicting, deciding, commanding, informing, requesting, and complying. These actions form the operating procedures

and range from the specification of the format of any communication to the operation of equipment.

c. Display. All parts of an information system involve output, but display is usually interpreted as the communication of data to people by machines. The display element is the major interface between the user and the rest of the system.

Some of the important aspects of display are:

(1) Degree of aggregation of data. This related to the degree of specificity of the data. Aggregation is the accumulation of data items of the same level of specificity. Generally, the higher-echelon users will require more aggregation. Decision-making and planning at higher levels generally cover broad areas of interest and involve larger amounts of information which must be summarized to avoid data "overload."

(2) Coding. This attribute of display is concerned with the particular form in which data is to be presented to people. The spectrum of modality used varies from visual at one end, which includes such things as graphs or pictoral forms (maps), to straight English narrative at the other end. Tabular formats would fall in between these two.

Much data can be coded in several different forms. Depending on the use of the data, more information can be derived from the data in one form than in another. Coding is an important consideration not only to the user of the data but also to the "hardware" designers since the characteristics will be partly determined by the display requirements.

(3) Initiation or Access. Some mechanism or criteria must be devised to cause the display of data to the right user at the right time.

Much information will be called for at irregular or infrequent intervals and may be displayed only when specifically requested. On the other hand, certain types of information may be required at regular intervals in an unvarying format. An automatic control mechanism can be devised which will produce the required display of data addressed to the specific users automatically. In between these two extremes may lie situations that require a certain display of information that can be triggered whenever a cueing event occurs. For example, in a water quality monitoring program, if a parameter being stored drops below the minimum desired level, an alarm might be produced, possibly along with information on other factors known to affect this parameter.

d. Equipment. Since this chapter is concerned primarily with the "software" aspects of information systems, little will be said about system equipment. In almost any large scale system, the digital computer is the central part of the system. An information system, as defined above, does not require elaborate equipment such as a computer to be classified as an information system. But from a practical point of view, the huge amounts of data generated and required in any field as broad as water resources management requires the storage capacity and the speed of operation which are the two outstanding features of the digital computer. Of equal importance is the capability of the computer to be programmed to perform routine evaluation and analyses of the data.

The equipment element can be regarded as two major units--the computer unit and the communication unit. The communication unit includes all hardware for sensing, inputing, outputing, and actual data transmission. The advent of remote terminals has revolutionized

communication, making access for input and output to a central computer available over distances of hundred or thousands of miles, instantly, as easily as dialing a long distance telephone call. In water quality monitoring, data can be collected in the field by automatic monitors, transmitted to a central station, coded, verified, stored, processed, and displayed, all automatically, without human intervention.[14]

e. Retrieval. Retrieval of information is a critical element of the information system. The technical aspects of computer retrieval are well studied and will not be covered here. Retrieval is basically just another part of programming which is discussed below and retrieval has been discussed somewhat in connection with other elements discussed above. One aspect that should be mentioned is that an indexing scheme is needed so that a human operator can readily perceive the structure and contents of the system data.

f. Programming. Programming is simply the means by which man communicates directly with the computer. While this is a part of the "software" aspects of information systems, it is of a technical nature and has received a great deal of attention. The state of the art has been raised to a high level by specialists in the field. In keeping with the overall theme of this chapter it will simply be stated that this programming must be performed with the user in mind and close cooperation between programmers and users must be maintained. The goals and objectives must be determined by the information user, with the programmer being responsible for determining and pointing out the capabilities and limitations of his art.

Other Aspects of Information Systems

The preceeding discussion in this chapter might seem to give the impression that all of the problems of decision-making would disappear if only an information system centered around a computerized data processing center existed to supply decision-makers with adequate information. Without detracting in any way from the importance of information in decision-making, it must be recognized that information and knowledge are not synonomous. Rather than overemphasize the role of information, a good information system must recognize its own limitations and contribute what it can in other aspects of the decision-making process.

Oettinger has attempted to explain the role of computers in decision-making by categorizing the tasks performed by decision makers.[15] Descriptions of these categories are somewhat involved and are not necessary for this discussion. For these different tasks, the usefulness of the computer varies from unquestionable predominance to marginal. For at least one category, he states that "the necessary things get done simply because the official system is usually bypassed, machines and all." Vannevar Bush has stated that "The investigator is staggered by....findings and conclusions....many of which he cannot find time to grasp, much less to remember", and he did not say staggered by the papers and the reports.... most of which he cannot find.[16] Perhaps the problem is best summarized by Tukey who states that "The unhandleable part (of information)--in people's minds, rough notes and conversation--which is often of greater importance, still escapes all tools of information pursuit except human memory."[17]

To address this problem, Oettinger suggests that a fresh approach is needed in using computers for such unhandleable information as the understanding and judgment of individuals. One such use of the computer might be to maintain detailed, accurate, and up-to-date organization charts to enable the sources of such information (that is individuals) to be easily found.

Handling non-quantifiable information such as narrative statements and social ideas is another challenge for an information system. Systems are in operation for written documents using abstracts and search routines based on key word descriptors.[18] An example of a proposed information system for other types of non-quantifiable information is An Information System for Improving the Evaluation of Non-Marketed Outputs.[19] While concentrating on evaluating environmental impacts, it provides a general framework for evaluating phenomena that are difficult to quantify. Basically, the system consists of two major information displays in the form of matrices with accompanying narratives. The first matrix is the Environmental Impact matrix which relates classes of project effects to a series of alternative designs. The cells of the matrix will consist of a positive or negative sign or a zero, to indicate positive, negative, or neutral effect. The Public-Participation Display relates project impacts to user groups. The cells of this matrix will also consist of a positive or negative sign or a zero, to indicate the evaluation of each user group.

This example is mentioned merely to illustrate that these difficult problems are being confronted and that an information system is much more than a computerized data bank. This example is a rather simple but innovative way of handling, summarizing, and displaying certain types of

non-quantifiable information. As such, it fits the earlier definition of an information system as a formal or rationally planned means whereby (users) receive and transmit information. The design and operation of information systems would appear to demand more innovative ideas and less technical complexity.

Information Needs of the Proposed New Organization

The characteristics of the Great Lakes Basin, its resource-use problems and the basic functions of a computer-based information system have now been presented. The next step is to develop some kind of a logical, systematic approach to the design of an information system specifically tailored to meet the information needs of the Operations Office and other users within the proposed new organization and outside.

The following six steps might form the basic elements of a design framework:

(1) Define each problem area (e.g. water quality, navigation);

(2) Determine the function of the Experimental Operations Office in the particular problem area;

(3) Determine the uses of the information;

(4) Identify types and formats of information needed by users;

(5) Identify sources of information; and

(6) Determine implications of the above steps for the information system.

Definition of the Resource Problem Areas. First, the Operations Office must have defined for it the precise set of Basin resource management problem areas which are to be under the jurisdiction of the new

organization as a whole. The list of five resource problem areas that was put together by the Canada-United States University Seminar (see page 124) is adopted in this volume. While the jurisdictional limits will be spelled out to one extent or another in the enabling treaty and related federal statutes, it is clear that if the proposed new organization is to have an honest claim to a comprehensive role in coordinating the efforts of all the governments in the Great Lakes Basin, then it must eventually concern itself with all of those problem areas identified by the Seminar.

Let us assume, however, that the initial functional scope of the new organization is described by those five resource problem areas discussed in the previous chapter. The second part of this step is for those officers at the policy-making level in the new organization to define each individual resource problem area in terms including: (1) societal goals (clean water, adequate power); (2) level of governmental participation and influence; (3) status of current research; (4) limitations placed on regulatory agencies by competing use of the same resource; (5) relative priority among other societal goals; and (6) geographical boundaries of the problem areas. The intent here is not an exhaustive analysis of each resource problem area. What is required, however, is that the policy makers of the new organization and the information specialists charged with the design of an information system be on the same wavelength with regard to how each resource problem area is conceptualized. This will provide extremely valuable guidance to the system designers which in turn will help to ensure satisfactory results.

Functions of the Operations Office. The coordination role of the new organization encompasses (as described in the previous chapters) three general administrative functions, namely: surveillance, mediation and control. These are three distinctly different organizational activities

requiring different kinds of information. In addition, each resource problem area is assigned to one of these three general functions (refer to Table 1).

For example, the problem area Municipal and Industrial Water Supply (which would not be among the initial five) was assigned a surveillance function. This was the case because, first, this is intrinsically a local concern with minimal interest outside the municipal or county level of government. Second, this problem area normally has no international impact except perhaps at international frontier areas. Third, there appears to be no need for a mediation role beyond, say the state or provincial level. It is properly a matter for an international body at a surveillance level only because of its interrelationships to other water resource problem areas such as Water Quality, Shoreline Protection and Development and possibly Lake Level Control. The surveillance function would be concerned primarily with monitoring of existing conditions and developing trends, such as ascertaining where communities and industries obtain their water and in what quantities. The role of the Operations Office would be to predict qualitative and quantitative changes in supply. The information required includes:

- Use inventory and projection of requirements based on population and economic data;
- Hydrologic data on supplies, e.g., runoff, lake volumes, ground water, precipitation and evaporation rates;
- Existing water quality and existing and projected water quality requirements.

Those resource problem areas assigned a management function other than surveillance, i.e., mediation and control, would be the primary concerns of the new organization. There are eight in total of which five are assigned to one of four functional boards as described in the previous

chapter (Air Quality and Water Quality being combined into one board). In general, these eight resource problem areas meet one or more of the following tests: (1) they are urgent problems (Water Quality, Lake Level Control); (2) they are international in scope or effect (Water Quality, Lake Level Control, Air Quality, Hydropower, Flood Control, Navigation); (3) there is precedent for joint programs (Hydropower, Water Quality, Navigation); and (4) there is a need for joint programs (Lake Level Control, Air Quality).

It is difficult to deal in specific terms with all of the various information requirements for these eight different concerns. It should suffice to say that they all require data and other research results far in excess of anything needed at the surveillance level. The mediation function encompasses joint programs and the promulgation (after appropriate coordination with the agencies concerned) of regulations, standards and compliance schedules. These activities require a broad range of information limited for the most part only by the boundaries of each problem area as they were established by the new organization in the first step of this sequence. Finally, the information requirements of the control function would be virtually the same as those for the mediation function.

Uses of the Information

One of the main purposes of the information system of the Operations Office is to coordinate information exchange among all interested parties, so the users will not be confined to those within the office. Identifying all of the specific users of water resource information would be a complex but necessary function of the information system. An attempt has been made

here to categorize the users by the primary use for which they need information. This categorization includes:

Research. The purpose of research is to gain an understanding of complex phenomena. Only with such understanding can problems be fully identified and defined. By studying correlations among different parameters, relationships and models of the phenomena can be developed. Simulation models are important tools of decision-makers providing the means to evaluate and predict the effects of natural events and man-made activities.

Regulation and Operations. This task is interpreted to mean the day-to-day activities of water and other resource agencies such as enforcement of water quality standards and operation of treatment plants or other facilities. This would also include any monitoring activities to obtain basic physical and biological data.

Planning. Planning is a long range activity and is concerned with identifying problems and developing programs to cope with these problems. This function might be considered a coordination of the other functions, as well as a separate function itself. Using the objectives and guidelines established, planning develops specific programs for managing problems. In developing these programs, the planning function makes use of results from the research function and recommends new areas of research.

Policy-Making. The task of policy-making is to determine the goals and objectives of water resource management in broad terms. The ultimate

responsibility for setting policies rests with the electorate and is expressed directly by the people as well as through their elected representatives. The legislation establishing any public agency will set the policy goals, often in broad terms, and the policy-makers in the agency then interpret these goals in terms of more specific objectives. However, this interpretation must be accomplished with input from the public and from other public agencies.

Other Factors

Program Responsiveness. Once a program has been established, it must be responsive to changing conditions and unexpected circumstances. Information on all aspects of the effectiveness of the program must be collected and interpreted. This illustrates the importance of the feedback mechanism in the information system model described earlier. In order for the program to respond to changing or unexpected conditions, there must be a continuous measurement of its effectiveness, by whatever criteria are applicable. The ultimate criterion is the ability of the program to solve or alleviate problems of concern to people in the region. Information must be obtained from the public to determine any changes in social objectives and to measure the effectiveness of the program in meeting these objectives.

If the objectives of the program do not change, the effectiveness will depend on how closely the physical, social, and economic models represent reality. Using the terminology of the information system model, the observable actions produced by the decision-makers must be transformed into data, fed back into the system along with perturbations

from the external environment, and used to adjust or revise the models used by the decision-makers.

Joint Planning. As noted in the previous chapter, the role of planning is to translate purpose to action. Ideally, the characteristics of the planning process include (a) the coordinated collection of all possible facts on the problem or issues; (b) the analysis of these facts in an objective setting; (c) the development of alternative solutions as guides to decision-making bodies in determining courses of action; and (d) the appraisal of results in implementing the plan and the initiation of review, modification, and updating of the plan to meet future developments.

The first two steps have obvious importance to the information system; in fact, they are two of the more important functions of the system--collection of facts and the analysis and interpretation of these facts. The third step involves the actual use of the information to develop courses of action to solve problems. Basically the planning function uses information gained from measurement of past and present conditions with predictive models to project future conditions under different courses of action. The last step is related to program effectiveness, to provide a basis for response. Use of information for this purpose has been previously discussed.

Types and Formats of Information

The types of information needed for each of the problem areas will have to be determined, based on a knowledge of the physical, social, and economic phenomena involved. Some of the basic formats in which the information may be obtained and used are listed below. This

listing represents a heirarchy of synthesis and aggregation. At each successively higher level, detail is sacrificed over the preceding level in order to gain an ability to see a larger picture. A possible categorization of formats might include:

Basic Data. Tables of basic data output generally are of limited usefulness. The major problems of water resource management involve complex physical, social, and economic phenomena and thus large quantities of data. Some degree of aggregation and interpretation is usually necessary before this data is meaningful for decision-making and planning. For certain situations such as the daily operation of a treatment plant, the scope of concern and the time period may be small enough that the basic data can be used to control operations. Also, examination of basic data may be useful to spot possible errors and unusual trends and patterns that might not be revealed in the usual evaluation procedures.

Numerical and Graphical Analyses. This would include standard numerical characterizations such as mathematical and statistical evaluation of means, maxima, minima, etc. This might also include simple graphing and mapping of the basic data to show time or geographical distributions. As the number of basic data items becomes larger, such interpretation becomes necessary to allow the data to be comprehended. This is a first step toward converting the data into information.

Relationships of Variables. As the phenomena being studied become more complex, more variables are introduced. The empirical relationships between variables must be determined to develop models to simulate responses of the physical, social, or economic system being studied. As discussed in the first part of this chapter, the models used by the

decision-making function are an important part of any information system. Reducing a large number of observations into one or a few mathematical relationships represents a high degree of aggregation and possibly considerable judgment since the relationship will not usually describe all of the events accurately. However, the form of the information is very useful for many purposes such as estimating the effects of natural or man-induced phenomena.

Non-Quantifiable Information. To the technically oriented, mathematical descriptions are the most effective means of transferring information, when such means are applicable. However, all information is not quantifiable and there are many non-technical people directly involved in resources planning and policy-making. Those at the higher levels of decision-making normally do not have the time to pour over detailed statistics, graphs, etc., and often must rely on summaries prepared by subordinates. This format can represent the highest aggregation of information but may be less precise and objective than the other formats. This format of information is the most difficult to handle in a computer-based information system since the computer is geared to numerical data processing.

Sources of Information. This is closely related to the task of identifying the users. In many cases the users will also be sources and vice versa. This two-way relationship between the Operations Office and the user/source should be fostered to provide incentives for the free exchange of information. Agencies should not be expected to devote their limited resources to providing information to the Operations Office unless they can expect to gain by their cooperation by receiving needed information in return.

As stated earlier, searching out all of the potential users/sources will be a difficult but essential task. The dynamic nature of our respective societies and of natural resource problems in particular, underscores the need for establishing lines of communication with users/sources to allow a continuous exchange of up-to-date information. One of the real problems of information exchange today is the different formats in which information is used by the different users. In areas directly related to water resources, the Operations Office could have as one of its major tasks, the standardization of information formats to facilitate information exchange. In other areas, such as social and economic information, the office should add its voice to the others calling for standardizing information, and use what influence it has to accomplish this.

Implications for the Information System

Based on the above considerations, certain implications for the information system can be deduced. These implications can be illustrated by a matrix which relates the four basic uses of information to the formats of information just discussed.

The first two formats of information discussed above, that is basic data and basic analysis involve data and procedures of a "programmed" nature. That is, the procedures for collection and handling are of a routine, repetitive nature. This feature plus the fact that the information is generally of a quantitative, numerical nature implies that this type of information lends itself readily to the "data bank" approach which emphasizes computerized techniques for collection, storage, and retrieval of large quantities of data.

Table 2

Relationships of Uses and Formats of Information

Uses	Primary Formats	
	Output from System to Use	Input from Use to System
Research	Basic and analyzed data	Relationships and models
Regulations and Operations	All formats (primarily basic and interpreted data)	Activity (transformed to basic data)
Planning	Relationships and models; interpreted data; narrative reports	Reports of proposed action
Policy Making	Narrative statements and reports; highly interpreted data	Narrative reports and statements (guides for plan)

On the other hand, the last two information formats, relationships of variables and non-quantifiable information, are generally of a "non-programmed" nature. Such information is not produced on a routine basis but is largely the result of research efforts, planning studies, etc., and is produced on an ad hoc basis as needs are recognized and resources are obtained. The real function of an information system for these kinds of information is establishing lines of communication with groups producing such information and maintaining an awareness of what information is being constantly produced. The computer can still be a valuable tool for dealing with such information, but its role is not as clearly defined or all-important as with routine numerical data.

An example of a computerized system for dealing with such information is the Water Resources Scientific Information Exchange program of

the United States Department of the Interior. This system stores abstracts of scientific literature, research reports, and engineering reports related to water resources. Key words or descriptors related to a particular user's interest are entered in the computer and a search routine produces a printout of references with abstracts which contain these descriptors. The difficulty of producing a relevant list of abstracts while at the same time not overwhelming the user with irrelevant material can be easily perceived. Possibly of more importance is the problem of obtaining all up-to-date information from the innumerable possible sources of such information. The interdisciplinary nature of resources planning requires information from a wide range of disciplines in the social and physical sciences and complicates the problem of maintaining up-to-date information from all possible sources.

The mission of the new organization as described in the previous chapter will require, it appears, information of both general types - programmed and non-programmed - in about the same proportions. The implication of this is that the system must not be approached with the emphasis on establishing primarily a large data bank of raw data. It must be a balanced system with due regard to the software aspects of information use. These aspects include the problems of establishing procedures for handling non-quantifiable information; establishing lines of communication to obtain and disseminate non-routinely produced information from diverse sources; an awareness of new techniques and methodologies requiring and resulting from new kinds of information; the flexibility to deal with new kinds of information; and close coordination with the users and producers of new information.

Obtaining information from and disseminating information to the public to induce and sustain public participation will be a vital task of the new organization. It could also be one of the more challenging tasks of the information staff because of the diversity of interested participants and the different kinds of information transmitted. Some of the mechanisms for disseminating information might include public notices, newsletters, news media, a speakers bureau, or published agency reports. Techniques for information collection include surveys by polling and interviewing, public hearings, public inquiries, and special task forces. Dialogue or two-way communication can include informal contacts, workshops, group advocates, advisory committees, formal meetings, and informal meetings.

A successful public participation program will require as a starting base, identification of potential participants; careful selection of the types and formats of information required by the different types of participants from the Operations Office, and by the office from the participants; and selection of the proper mechanism for information transmittal. The availability of additional information such as agency reports should be stressed in the standard means of communication such as newsletters.

An examination of the sources of information reveals that in many areas (such as the following case studies on Urban and Industrial Land Use and Water Quality), fairly comprehensive and sophisticated information systems are presently in existence or are being developed. When this situation exists, there would be little point in duplicating such efforts. Besides the obvious waste of resources, it is conceivable that the

operators of these other systems would be less than enthusiastic about cooperating in a duplicative effort that could undermine their own systems. When such information systems exist, they should be used as much as possible and duplicated as little as necessary. None of these existing systems is international in scope. The function of the information system of the new organization should be to coordinate and enhance these systems and fill in any gaps in geographical or functional coverage.

REFERENCES AND FOOTNOTES - CHAPTER III

[1]Perry Rosove, Developing Computer-Based Information Systems, John Wiley and Sons, Inc., 1967, p. 3.

[2]Marshall C. Yovits and Ronald L. Ernst, "Generalized Information Systems," in People and Information, Harold B. Pepinsky, ed., Pergamon Press Inc., 1970, p. 9.

[3]Rosove, op. cit., p. 4

[4]Kenneth L. Kraemer, "A Model for Urban Information Systems," in Information Technology in a Democracy, Alan F. Westin, ed., Harvard University Press, 1971, p. 328.

[5]Organization for Economic Cooperation and Development, Information for a Changing Society, Paris, 1971 (available from OECD Publications Center, Washington, D. C.).

[6]Edward L. Brady and Lewis M. Branscomb, "Information for a Changing Society," in Science, Vol. 175 (March, 1972), pp. 961-966.

[7]Ibid, p. 962.

[8]Martin Greenberger, "Computers in Organizations," in Information Technology in a Democracy, Alan F. Westin, ed., Harvard University Press, 1971, pp. 151, 154.

[9]Yovits and Ernst, op. cit., pp. 3-9.

[10]Rosove, op. cit., p. 17.

[11]Ibid., p. 67.

[12]Ibid, p. 94.

[13]Ibid, pp. 105-118.

[14]See, for example, the Ohio River Valley Water Sanitation Commission system described in William Klein, et. al., "An Integrated Monitoring System for Water Quality Management in the Ohio Valley," Environmental Science and Technology, Vol. 2, No. 10 (October, 1968), pp. 764-771.

[15]Anthony G. Oettinger, "A Bull's Eye View of Information Systems," in Information Technology in a Democracy, Alan F. Westin, ed., Harvard University Press, 1971.

[16]Vannevar Bush, "As We May Think," quoted in Oettinger, op. cit., p. 260.

[17]J. W. Tukey, "The Citation Index and the Information Problem," quoted in Oettinger, op. cit., p. 260.

[18]For example see the Water Resources Scientific Information Center described in Office of Water Resources Research, Water Resources Research Catalog, National Technical Information Service, U.S. Department of the Interior Annual Publication.

[19]James D. Evans, An Information System for Improving the Evaluation of Nonmarketed Outputs, U.S. Army Engineers Institute for Water Resources Report 71-5, National Technical Information Service, 1971.

CHAPTER VIa

CASE STUDY: ECONOMIC DATA AND INFORMATION

Introduction

An area of importance to the new organization is that of economic phenomena and their implications for the resources of the Great Lakes region. The new organization would require and utilize economic data and information in two separate but related ways.

The first would be to serve the surveillance function. The joint organization would have a resource planning coordination function and not an economic policy coordination function. In carrying out the former function it may (and probably should) influence the latter, but such influence would be indirect and diluted. Hence the role of the new organization with regard to economic development within the region would be limited to one of surveillance. This would consist of monitoring the trends and indices of economic development in the Great Lakes region and assessing the effects of such development on the water and other resources of the region.

The other need for economic data and information would be the development of an economic data base to assist the resource agencies of both countries in carrying out their particular responsibilities. Here the focus would be on basic economic data of a specialized nature for specific tasks such as estimating future water requirements or calculating benefits and costs of policy alternatives.

This case study is not a review of resource economics. That is to say that it is not concerned with such issues as externalities, (internalizing external diseconomies,) the validity of benefit/cost analyses

in the justification of construction projects or the relationship between social overhead capital and privately owned factors of production. While these are very important matters, they are more properly the concern, at least in our organizational model, of the proposed Research Advisory Board and not of the Operations Office and its information staff.

The purpose of this case study is threefold. First, there is a description of the various categories of economic data and information required. Second, potential sources of these data and information both in Canada and the United States are suggested. Third, some specific applications of economic data and information are described. The discussion is in the context of the Lake Ontario Basin and the water resources of that region.

Economic Information Requirements

Demographic and economic base studies of a region are vital to many areas of planning and policy-making other than resource planning. A large number of federal, state, provincial and local agencies are engaged in such studies. These agencies can provide the Operations Office with much of the data and information needed. The tasks of the office would then be primarily to search out such sources, acquire the necessary information and store it in appropriate format for use by the new organization and other users.

An example of the kinds of economic data needed in an economic base study for a water resources planning agency is provided in Table 3. This outline was prepared in 1964 by the Erie-Niagara Regional Water Resources Planning and Development Board, in cooperation with the New York State Water Resources Commission.[1]

Table 3

Example of Economic Base Study Information

Inventory of Resources for the Economic Area and Subareas

1. People
   a. Numbers and growth (decline) trends since 1900
   b. Age-Sex distribution
   c. Mobility trends - net migration movements
2. Natural Resources of the Area and Subareas
   a. Air
   b. Water
   c. Minerals
   d. Forests
   e. Soils types
   f. Weather, terrain, geography, etc.
   g. Fish and wildlife
3. Man-made Assets
   a. Business and industrial plants
   b. Residential complex
   c. Public works, e.g. parks, dams, roads, airports
   d. Transportation facilities - public and private
   e. Cultural centers
   f. Medical institutions
   g. Educational system
   h. Governments and private institutions for dependents

The Basin Economic Base

1. Structure
   a. Manufacturing, trade service, construction, transportation, finance, utilities, government
   b. Agriculture
   c. Identification of "export" industries
   d. Inter-industry ties
2. Geographic Distribution of Economic Activity
   a. County-by-county study of employment centers
   b. Development and mapping of future land use pattern
3. Performance of Area and Subarea Economies
   a. Employment and Unemployment
      1. Comparisons - Nation, State, Region
   b. Personal Income - Totals and Per Capita
      1. Level, distribution and origin
      2. Comparisons - Nation, State, Region
   c. Growth Trend Analyses of Employment and Income
      1. Comparisons - Nation, State, Region
   d. Study of Value Added by Manufacture Statistics
      1. Trend in totals
      2. Productivity per worker (two or three digit) Standard Industrial Classification grouping)

Table 3 (continued)

Example of Economic Base Study Information

The Basin Economic Base (continued)

3. Performance of Area and Subarea Economies (continued)
   e. Performance of Non-manufacturing Sectors
      1. Agriculture
      2. Trade
      3. Services
      4. Utilities
      5. Transportation
      6. Government
      7. Contract Construction
      8. Finance, Real Estate, Insurance
   f. Sensitivity of Area and Subarea Economies to Business Cycles
   g. Net Social Benefits Accruing to Area and Subareas
   h. Amenities available in the Area

Projections

1. Employment to 2020 by County, Subarea and Area
   a. By Sector and Industry (two or three digit Standard Industrial Classification groupings)
   b. Based on:
      1. Trend Analyses
      2. Shift patterns
      3. Industry studies
      4. Inter-industry relationships
      5. "Export" - "Service" Ratios
      6. Location Quotients
      7. Field studies in Area
      8. Comparisons with Labor Force Projections and Assumptions re: Unemployment Levels
2. Population
   a. By County, Subarea and Area to 2020
   b. Based on projections of birth, death, and migration rates
   c. Tempered by projections of employment opportunities
3. Industries of the Future

Source: Plan of Cooperative Study for Comprehensive Water Resources Development (Ref. 1)

In addition to the economic base studies, which are general studies describing the present and future economic environment of the region, water service demand studies are required.[2] These demand studies are necessary as a basis for estimating benefits from water resources development. Much of this information is not readily available and will have to be developed by the Operations Office itself or through research projects sponsored by that office.

For industrial use, descriptive inventories of regional industrial water use are needed for the region. These inventories should include water usage classified by quantity and quality of industrial withdrawal, consumption, recirculation, and discharge flow. Further classifications should include type of industry, size, technology, plant age, climate, source of water supply, cost of water and type of water usage. In addition to these descriptive inventories, analytical studies are necessary to estimate future demands. These studies should include the sensitivity of locational decisions to water availability and cost, technical substitution possibilities, price elasticities of water, and probable impact of future technology.

Descriptive inventories of residential use should include quantity and quality of residential water withdrawal, consumption, recirculation, and discharge, classified by community population size and density, average disposable personal income, the price of water services, climate, and other significant variables. Research on residential water use has been conducted by the Johns Hopkins University.[3] Analytical studies should consider the sensitivity of migration patterns to water availability

and cost, and price and income elasticities of residential demand for water services, as well as future technological impacts.

Agricultural use studies should include inventories of use classified by purpose of use, source of supply, cost of water, type and value of agricultural output produced, amounts and costs of other inputs used (labor, capital, materials), crop yields, etc. Agricultural production functions should be developed which will reveal the marginal physical product of water in agricultural production. These functions would facilitate studies of the elasticity of substitution of other inputs for water. The impact of future technology on these elasticities should be examined. Estimates of future demands for agricultural products are also needed.

Water-based recreational demand is growing rapidly as the population increases and as people have more disposable income and leisure time. Inventories of the present use of recreational resources should be conducted, classified by type and extent of use, user cost including distance traveled, length of stay, and by the quantity and quality of water required. A great deal of research remains to be done in the analysis of recreational data. Surprisingly little is known about the relationships between public recreation and demand, disposable personal income, income distribution, amount of leisure time, costs of recreational services, the types of recreation chosen, etc. Water-based recreation demand functions need to be developed to relate regional demand to the relevant variables.

Similar descriptive and analytical studies are needed for all other water uses, including flood control, shoreline protection and development, navigation, hydropower, and fish and wildlife.

Sources of Economic and Demographic Data

The importance of adequate demographic information was recognized even at the time the United States Constitution was written. The first article of the Constitution adopted in 1787 provided for a population census or "enumeration" to be conducted every ten years. Over the decades, the scope of census activities has grown to include many facets of the nation's life. Today, the statistical system of the Federal Government involves a vast machinery for collection and dissemination of all kinds of demographic and economic data.[4]

United States-Federal. In the United States Federal Government, the statistical information responsibilities are not centralized but are divided among agencies according to their subject matter fields. A large proportion of the statistical activities of the Federal Government are accounted for by general purpose statistical agencies, the most important of which is the Bureau of the Census. The purpose of these agencies is to collect, and publish general purpose statistics. The other general purpose statistical agencies are more specific in scope and include the Bureau of Labor Statistics, Statistical Reporting Service of the Department of Agriculture, National Center for Health Statistics, and the National Center for Educational Statistics. Because of its resources of equipment and skills, the Bureau of the Census performs services for these other agencies, including data collection.[5]

Other important types of agencies involved in statistical information include advisory bodies and administrative, research and regulatory agencies. The advisory and research agencies' primary role is the analysis or interpretation of data from their own or other sources.

There are many such agencies but examples include the Council of Economic Advisors and the Office of Business Economics. Most administrative and regulatory agencies collect some statistical information in the course of their operations. Much of this information is of limited general interest and is used primarily to support agency programs, but much important information of general interest is also generated in the process.

The Bureau of the Census collects the following kinds of information: population, housing, agriculture, business (retail, wholesale, and services trades), manufactures, mineral industries, transportation, and governments (state and local units). This information is collected at five year intervals (10 years for population and housing), with sample surveys at more frequent intervals--monthly, quarterly, or annually.[6]

Before 1960, the Census Bureau was primarily a production agency--the product being a set of printed volumes summarizing the results of each census. Its mission was accomplished when the publications were printed and there was little consideration given to access and use of the vast amount of data not published. Since 1960, the trend has been toward the Bureau as a service agency. There has been a growing community of users whose needs were not met by the published reports. Information is often needed in more detail, in special tabulations and categories, or in machine-readable form, suitable for efficient analysis to the user's own specifications.[7]

The 1960 census was the first wholly computerized census operation. Basic record tapes were created containing information about each household, and summary tapes were prepared from the basic tapes. Users quickly took advantage of the possibilities and purchased many data

products and services such as special tabulations and matching studies of the basic record tapes. The Bureau is now giving emphasis to further developing its role as a data deliverer as well as a fact finder. Two important Census Bureau publications of interest to potential users of census information are cited as references 8 and 9.

The non-published data are available in the form of computer punchcards and tapes. These data may be obtained and analyzed by the user or the Bureau will process the information in the form desired, at the expense of the user. Safeguards are provided to protect confidential data and make identification of individual persons, enterprises, farms, etc., impossible without written authorization of the person or legal representative of the person or organization involved. For special services, the user pays only the actual cost of the service and not for collection of the data. However, the Bureau does undertake special surveys to collect data on a reimbursable basis under certain conditions, one of which is that the Bureau must determine that there is a public interest in the survey results.

The Bureau of the Census and the other Federal general purpose statistical agencies basically only collect and compile data. At the state level, there are data collection activities, but the Federal statistical services provide the bulk of economic and social data. This fact is plainly evident from the sources cited in various state economic studies and planning reports. The basic data provided is compiled and analyzed on a regional basis by a number of state agencies.

New York State. In New York State, the Office of Statistical Coordination of the New York State Division of the Budget publishes an

annual New York State Statistical Yearbook.[10] This yearbook is designed to serve as a single comprehensive source of statistical data about New York State and also identifies the major sources of such data, with information about their regularly published statistical series. The following agencies are sources of information needed to establish an economic data base for water resources planning:

(1) Department of Agriculture and Markets. Published and unpublished statistics on agricultural activities.

(2) Department of Commerce. Collects and publishes economic, population, and related data from a variety of sources.

(3) Department of Labor. A major source of statistics on employment and unemployment.

(4) Office of Planning Services. This is the state's central long-range planning agency. It produces no regular statistical series but has the responsibility for making population projections. It also makes important economic studies of the state's economic regions.

(5) Department of Transportation. This agency is concerned with the development and operation of such transportation facilities as highways, mass transit systems, marine and aviation facilities, and the state's waterways. It annually updates an inventory of traffic volume and physical condition data for the 13,000 miles of the state highway system.

As stated above, the Office of Planning Services (formerly the Office of Planning Coordination) is the state's central long-term planning agency. As such, it is a valuable source of information for any planning agency, providing special compilations, analyses, and

projections of the basic economic and related data provided by such sources as the Census Bureau. It is responsible for formulating a comprehensive plan to guide the economic, social, and physical development of New York State, and has produced the New York State Development Plan - 1[11] which proposes for the year 1990 the distribution of land uses, population or settlement densities, and transportation corridors. The agency also coordinates and assists planning by the various state agencies; coordinates state planning with that of local, Federal, or private groups; conducts research to provide uniform information and projections; and administers technical and financial assistance for local planning.

The Office of Planning Services has prepared a series of regional economic studies for the economic planning and development regions of New York State. These studies are published in two phases. Phase I includes basic inventories and analyses of past and present situations. Its purpose is to place in perspective the demographic, economic, and public financial factors affecting the development of the region and is designed to help orient state and regional planners toward the requirements of the area. Information is provided on a regional, county, and smaller area basis. The information includes a broad overlook of the region, its topographic features, problems and developments in agriculture; changes in population, its distribution and social influence (education, marital status, etc.); the economic structure, as reflected in the labor force, industry and occupational distribution and the level and change in income; economic activity in manufacturing, trade and service; the financial structure and problems; and recent

changes in population and employment and some problems and strengths of the individual counties.[12] Phase II consists of analyses and projections. It describes present trends in demographic, economic, and public finance factors which affect the region's development and analyzes how government planning might affect the economic trends. One such report, the Central New York Regional Economic Study, is based largely on a survey of manufacturing firms asking opinions about such factors as water, and the firm's plans for expanding or relocating.[13]

Another series of reports produced by the office is the Community Profile Series, also for each planning region of the state. These publications are computer-printed rankings in 15 categories concerning size, wealth, and urbanization of each city and town in New York State, showing how each community ranks in relation to its county, its region, and the state. These publications are the first to result from the Planning and Environmental Data System being developed by the New York State Office of Planning Services to provide uniform data for all planners in the state. The categories in these reports include: total population, land area, property value, property tax, median family income, per capita property value, per capita property tax, percent of family income over $2000, percent of family income over $4000, population density, property value per acre, property tax per acre, percent of sound housing, educational level in median years, and population mobility.[14]

Another important information service in New York State is the Land Use and Natural Resources (LUNR) Inventory. This program was developed by the Cornell University Center for Aerial Photographic Studies under contract to the New York State Office of Planning Coordination (now Services).

The initial data were obtained from aerial photographs of New York State, specially flown for the purpose, with other information obtained from secondary sources, mostly in published form, maps, etc. Information contained in the inventory consists of 14 main categories (see Table 4). The data consists of three types of measurements--area (in hectares), point data (counting of facilities), and linear data (miles of shoreline or streams).

The information was mapped on USGS 7 1/2 -foot maps and overlays produced on transparent film. These overlays can be obtained by the user and used with the easily obtained quandrangle maps. In addition, the information has been stored in computer form to facilitate handling and processing. The smallest geographical area for which information can be obtained is the Universal Transverse Mercator (UTM) Grid Cells, which are identified by the southwest coordinates of each cell. One cell represents a square kilometer in area (or 247.1 acres). The state of New York (50,000 square miles) is divided into approximately 140,000 such UTM grid cells.

Land use information, consisting of 129 data items for each of the 140,000 cells is stored on one IBM 2316 disk and additional information on soils, economic viability of farms, geology and depth-to-bedrock are contained on a second disk. Space is available for another 200 items and the storage can be expanded to accomodate additional items per cell. Updating of information can be accomplished without destroying the old data, by using the additional storage space. In this way, comparisons can be made to analyze land use changes. Original plans anticipated a 5 or 10-year updating cycle.

Table 4

New York State LUNR Inventory Categories

ACTIVE AGRICULTURAL AREAS
Orchards
Vineyards
Horticulture or Floriculture
High Intensity Cropland
Cropland and Cropland Pasture
Pasture
Specialty farms

INACTIVE AREAS
Inactive Agricultural Areas
Urban inactive Areas
Under construction (non-agr.)

FOREST LAND
Forest Brushland
Forest Lands
Plantations

WATER RESOURCES
Natural Ponds and Lakes
Artificial Ponds
Streams and Rivers
Marshes, shrubwetlands and bogs
Wooded Wetlands
Marine (Salt) Wetlands
Marine Lakes, Rivers & Seas (embayments and sounds)
Hudson River (N.Y. City to Mohawk River)

RESIDENTIAL LAND USE
High Density
Medium Density
Low Density
Strip Development
Rural Hamlet
Farm Labor Camp
Rural Estate

COTTAGES AND VACATION HOMES
Shoreline Development

COMMERCIAL AREAS
Central Business Sections
Shopping Centers
Resorts
Strip Development

INDUSTRIAL AREAS
Light Mfg. and Industrial Parks
Heavy Manufacturing

OUTDOOR RECREATION
Outdoor Recreation Land Use

EXTRACTIVE INDUSTRY (Mining)

Open Mining
Stone quarries
Sand and Gravel Pits
Other open mining

Underground Mining
Underground mining

PUBLIC AND SEMI-PUBLIC
Public and Semi-Public Land Use

TRANSPORTATION, COMMUNICATIONS AND UTILITIES
Highways
Railway
Airport
Barge Canals
Port or Dock Facilities
Shipyards and Dry Docks
Locks and Water Control Structures
Pumping Stations, gas & oil, electric, etc.

NON PRODUCTIVE LAND
Sand
Exposed rock cliff, slopes and slide areas

Source: The New York State Land Use and Natural Resources Inventory (Ref. 15)

Computer output can be obtained for any study area, in tabular or graphical display, after the study area is defined by coordinates. The DATALIST program (tabular output) lists the requested data for each cell and aggregates for the study area. The PLANMAP output (graphical display) provides summary information and displays information in a graphic manner to highlight patterns and geographic interrelationships of data visually. However, this output contains less detail than is available from DATALIST.[15]

It was stated earlier that long-range planning for water resources development must take place within a framework of the anticipated future economic and social environment of the region. These anticipated conditions must be based not only on past trends and projections of growth and development, but must also take into account government plans and activities which attempt to influence the economic and social development. Besides being influenced by development, the possible role of water in directing development must be explored and defined when possible.

Planning for future development in New York State has come a long way since it was introduced as an essential policy of state government in 1961. The Office of Planning Services has recently published the New York State Development Plan - 1, the first phase of a comprehensive statewide plan, which deals with patterns of land use and settlement for a population of 23 million, forecast for around 1990. This plan provides for the first time a common framework of developmental objectives for all planning efforts in the state. This phase of the plan deals with physical development aspects because these could be accomplished first. Two forthcoming phases will have in turn an economic and a social emphasis.

However, the interdependencies of these three aspects require that they be integrated to a certain extent in every stage of the work.[16]

Planning activities at the state level are directed at functional planning, which views government activities as an interrelated system of "functional" programs. The state's concerns have been classified into ten broad functional areas such as economic development, natural resources, human resources, etc. All government activities influence patterns of land use and settlement. The direct influence of such projects as roads, parks, water systems, and public roads is small in volume compared with private activities but important in their indirect influence on private decisions about location and land use. At present, the state's powers to affect actions of other governments, private groups and individuals, and state government itself, fall into five broad categories. These categories are: coordination, land use controls, location of public facilities, education, and fiscal incentives. These first three categories have obvious implications for a comprehensive water and related land management office. Close coordination with the state, involving both input and output of information about goals and activities is a practical necessity.[17]

The first phase of the State Development Plan contains information on goals to be followed for important aspects of the physical environment; practical objectives to be achieved in pursuit of these goals; and the resulting statewide settlement, land use and transportation patterns proposed for 1990, which if achieved, would fulfill those objectives. A number of action steps are suggested for consideration by the Governor and the Legislature. The plan deals only in the broadest terms, because

the detailed working out of the plan's objectives must be done on a regional and local basis. Much detailed work has been done by localities but much more remains to be done. Until now, localities could not relate to more than their own territorial horizons. The plan provides for the first time a common structure, a framework of objectives for the entire state.[18]

Canada-Federal. In Canada, a situation similar to that in the United States exists with respect to economic and demographic information. The Dominion Bureau of Statistics conducts a decennial census of population and housing and also collects basic data on agriculture, manufacturing, wholesale and retail trade, etc. The users of socio-economic data in Canada have been confronted with the same types of problems which have been previously discussed with respect to the federal statistical services of the United States Government. The inadequacies of former methods of compilation and dissemination of information have been increasingly apparent and have forced the Bureau of Statistics to shift more to a user service orientation.

One of the major problems is that the rapid advance in data processing technology and statistical methodology together with the expansion of statistical needs of data users has rendered former methods of collecting, organizing, and disseminating data inefficient and obsolete. Means of more convenient manipulation and integration of data currently being gathered at great cost are needed to allow adequate utilization. A second, and related, major problem is that governmental collection and development of information is conducted on an ad hoc basis. Considerable data are collected by agencies in the course of their normal activities. Too

often, these data are used only for the particular agency's operational responsibilities, with little attempt at interagency use. Little attempt is made to determine if the data needed already exist; if another agency needs data which could be easily collected, with little additional effort during a proposed survey; or if methods, procedures, and coding can be standardized with those used elsewhere.

In response to these problems, the Dominion Bureau of Statistics has under development a computerized system for providing census data for large urban areas on a user-specified basis. This system is the Geographically Referenced Data Storage and Retrieval System (GRDSR), commonly called Geocoding. The system basically provides data on large urban centers to be quickly and inexpensively selected and aggregated for areas specified by the user, as opposed to present standards, such as enumeration areas, census tracts, and municipalities. Eventually, diverse socio-economic statistics from other surveys could become available on a similar basis, with cross-tabulations in a variety of combinations. Recognizing the importance of Geocoding for urban analysis and policy planning, the Ontario government formed a team comprised of members of the Department of Treasury and Economics and the Department of Highways to investigate the possibility of applying Geocoding techniques to projects in Ontario.[19]

The Canada Land Inventory is a comprehensive survey of land capability and use for various purposes, being undertaken as a cooperative Federal-provincial program under the Agricultural Rehabilitation and Development Act (ARDA).[20] This inventory defines the land capability for agriculture, forestry, recreation, and wildlife management. Present land use

information is broadly classified with the most important aspect considered to be the breakdown between lands that are intensively cultivated and those that are in less intensive use, such as pasture. In addition, the program will attempt to assess social and economic factors relative to land use. Statistical data are available from the Dominion Bureau of Statistics on most of the important socio-economic factors. Much of this information is available on computer tapes and can be readily utilized by a computer system. Such data include: type of farming, economic classification of farms, age of operators, size of farms, capital investment in farms, and population characteristics.

Information from the inventory is presently available mostly in map form. The computer has been utilized in storing, analyzing, and presenting data as tables or maps. However, it appears that the computerized part of the program output has not yet been as fully developed as the New York LUNR system in certain aspects such as the handling and aggregation of data on a small-scale grid system.

Ontario Province. At the provincial level, the Ontario Department of Treasury and Economics is a major source of economic information. Provincial agencies compile data in various fields, using the Dominion Bureau of Statistics as a major data base. Information in specific areas such as agriculture and transportation is handled through the respective provincial agencies, such as the Department of Agriculture and Food and the Department of Transportation.

The Department of Treasury and Economics includes an Economic and Statistical Services Division. The Ontario Statistical Centre is a part of this division. The Centre prepares a bimonthly Ontario Economic

Review which presents current information on economic activity in Ontario, as well as articles of interest. In addition, the Ontario Statistical Review is published as an annual reference supplementing the Ontario Economic Review. Its two basic objectives are to provide an historical perspective for the economic indicators in the Economic Review and to bring together a wide range of information relating to Ontario's economy.

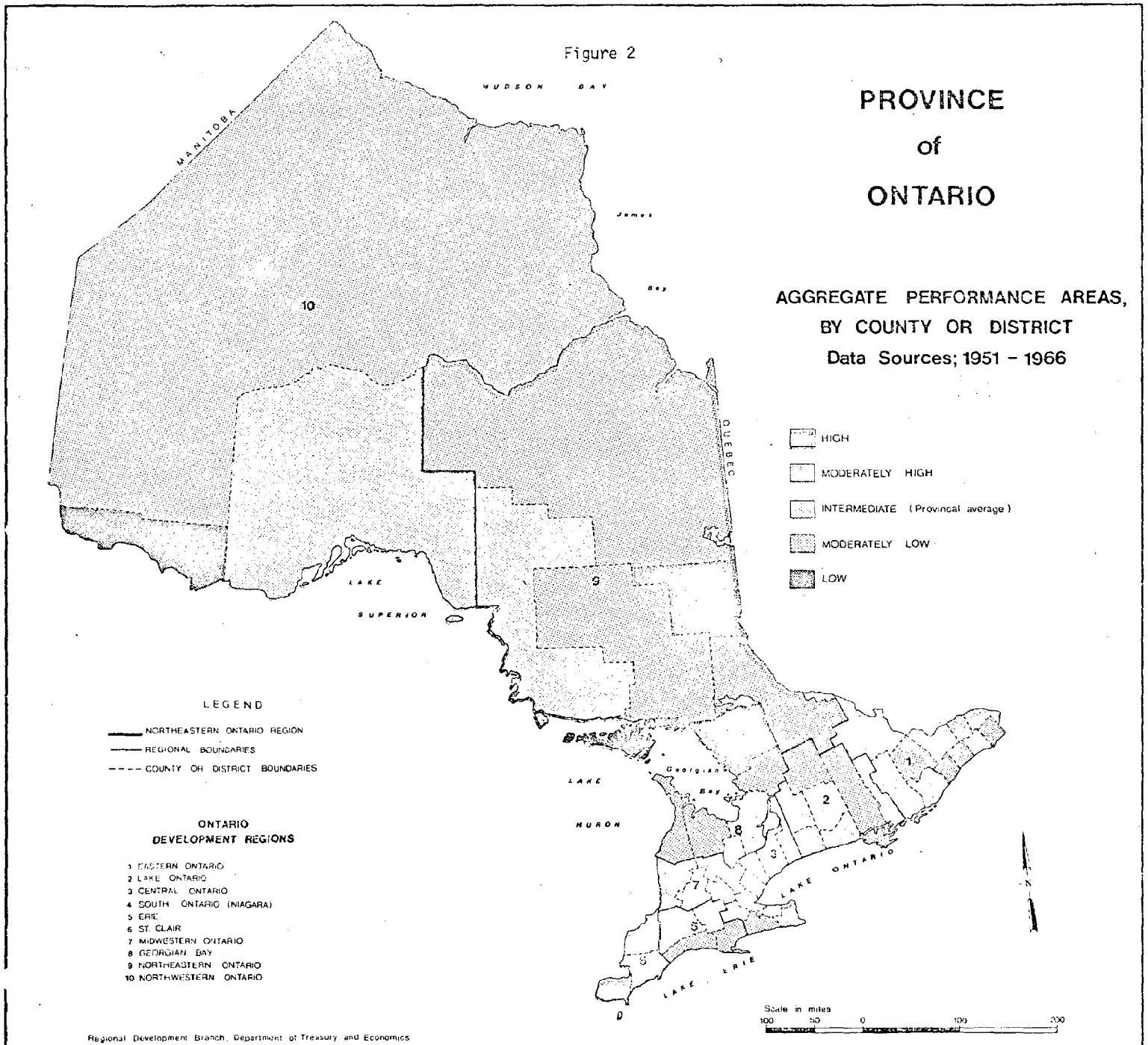
The Regional Development Branch in the Ontario Department of Treasury and Economics plays a major role in guiding and coordinating planning and decision-making at all levels as they affect the overall development of the Ontario region. It is similar in many respects to the New York State Office of Planning Services, in that it attempts to provide a framework of future goals and objectives of the region, to guide activities at all levels of government and private enterprise. The Regional Development Branch has published a number of Design for Development reports which deal with regional development in Ontario. The regional development program is described in Design for Development in Ontario: The Initiation of a Regional Planning Program.[21]

The Regional Planning Program is based on fundamental democratic principles and involves the people in all phases of specific policy development. It is also based on a second fundamental principle of coordination among the three levels of government and private enterprise.[22] As such, the program is a major source of information on social goals and policies regarding future regional development. The necessity of cooperation and information exchange between the Regional Development Branch and the Experimental Operations Office should not need elaboration.

The Regional Development Program recognizes three major trends which create problems and with which the program must cope. These three trends are: the increasing tendency of populations to concentrate in certain urban areas; the tendency towards unstructured sprawl in these areas; and the sometimes unwise use of the physical setting--the land, water, air, and other natural resources.[23] To project future trends, two basic approaches were recognized. The first approach is to use mathematical models of input and output. Such models are being prepared by the Economic Analysis Branch, but the lack of refinement of data needs necessitated reliance on the second approach, that of studying past trends. To carry out these studies, 63 indicators of change were examined for the census years of 1951-1966, or any more recent years for which data could be obtained. Not all required data were available and due to the lack of resources for collecting new data, the indicators were selected partially on the basis of available data.[24]

The Department of Treasury and Economics has divided Ontario into ten Development Regions. The regions bordering Lake Ontario include the Niagara, Central Ontario (Toronto-Centred Region), Lake Ontario, and Eastern Ontario Regions. (see Figure 2). A series of descriptive and analytical studies of each region has been prepared. These surveys are intended to provide detailed background for understanding the past location of economic activity in Ontario, and to indicate the contribution of each region to the economic life of the province. A wide range of information, ranging from physical environment to economic characteristics, has been included, and change over time has been indicated where data are available.[25]

Figure 2


PROVINCE
of
ONTARIO
AGGREGATE PERFORMANCE AREAS,
BY COUNTY OR DISTRICT
Data Sources; 1951 - 1966
HIGH
MODERATELY HIGH
INTERMEDIATE (Provincal average)
MODERATELY LOW
LOW
HUDSON BAY
MANITOBA
James Bay
QUEBEC
LAKE SUPERIOR
LAKE HURON
Georgian Bay
LAKE ONTARIO
LAKE ERIE
LEGEND
NORTHEASTERN ONTARIO REGION
REGIONAL BOUNDARIES
COUNTY OR DISTRICT BOUNDARIES
ONTARIO
DEVELOPMENT REGIONS
1 EASTERN ONTARIO
2 LAKE ONTARIO
3 CENTRAL ONTARIO
4 SOUTH ONTARIO (NIAGARA)
5 ERIE
6 ST. CLAIR
7 MIDWESTERN ONTARIO
8 GEORGIAN BAY
9 NORTHEASTERN ONTARIO
10 NORTHWESTERN ONTARIO
Scale in miles
100 50 0 100 200
Regional Development Branch, Department of Treasury and Economics

Specific Applications of Economic Data

In previous sections, needs for economic data and their usage in a general way have been discussed. The approach was conceptual in tone and focused largely on research needs to develop theoretical models for deriving demand functions and evaluating benefits in an economically desirable way. The need for developing and using conceptually correct methods and information is very real. There has been considerable criticism, by economists and others of the practical applications of economic information and methods used by water resource planners. However, the development and protection of our water resources are matters of urgency that can not await the perfection of the desired models or the availability of complete information.

This section describes three specific applications of economic information. These cases (Municipal Water Demand, Industrial Water and Water Quality Control) are set forth only as illustrative examples and there is no claim that the treatment is complete. It is also assumed that the methods of use will change as more sophisticated predictive models and techniques are developed.

The basic problem in these three instances is that of determining present and projected demands. Actually, the term "requirements" would be more appropriate since "demand" has an economic connotation of demand functions which, even if they exist, are not of much help in the practical world.

A program of national economic analysis and projection for use by water resource agencies in the United States has been instituted under the aegis of the United States Water Resources Council (WRC) and performed

by the Office of Business Economics of the United States Department of Commerce and the Economic Research Service of the United States Department of Agriculture. This program is referred to as the OBERS program. These projections are made on the basis of past trends, with reasoned modifications. An important point is that government actions, possibly stemming from these projections, can affect future conditions and possibly cause the projections to be in error.[26]

The methodology used in such projections is beyond the scope of this discussion. Some of the important variables are:

--Population

--Personal Income

--Agricultural Output

--Labor Force

--Gross Product by Industry

--Employment by Selected Industries

These studies have been conducted on economic areas delineated by OBERS. Basically, projections are made on a national basis and then successively disaggregated into regions and then, economic areas. The economic areas are composed of blocks of several whole counties. The problem encountered in using OBERS projections is that the data may have to be further disaggregated for more detailed information and then possibly reaggregated for different planning areas of the water resource agency.

The degree of aggregation or disaggregation is one of the primary considerations in the use of economic data. The degree of detail required will have to be evaluated on a problem by problem basis. Generally,

economic projections on a county basis would appear to be adequate for long-range planning. The county is the smallest unit for which current economic information is readily available except in metropolitan areas. In these areas, as discussed previously, computer procedures, such as Geocoding in Canada, are being developed to provide data by user-specified small areas. The uncertainty and imprecision of future projections would probably not warrant any more detail than the county level. The regional economic studies conducted by the New York State Office of Planning Services make certain projections on a county basis. Such projections include population, labor force, employment by industry group, employment by occupational group, and family and per capita income.[27]

The following examples are included to show specifically how the economic and demographic data base is used for particular problem areas. Such analyses would have to be performed for all of the problem areas to determine what information is needed, and in what form.[28]

Municipal Water Demand. The general method ordinarily used in projecting demands for municipal water is straightforward. It consists of multiplying the projected population by the projected use rate in gallons per capita per day (gpcd). The problems encountered are, first, in disaggregating population predictions to smaller units such as counties or townships, and second, in estimating trends in per capita rates of use.

Some of the variables which affect future per capita use rates are: (1) the general state of the region's economy, (2) degree of industrialization, (3) average per capita income, (4) climate, (5) water pricing policies, (6) relative size of the service area and (7) extent of metering. The economic base study should provide information on the

state of the economy and certain other factors, such as personal income. Evaluation of these factors along with projections of these factors for the future serve as guides for demand forecasts. Population data also have a bearing on the per capita use rate. It has been observed that, for example, large city water demands are greater, per capita, than that of a small city or town. An emerging issue which cannot be considered here, is the question of demand modification by social and economic devices, and improved efficiency of applied technology.

Industrial Water Demand. There are two basic methods used to project industrial water demand. One method requires industrial projections of employment in an industry and uses a water-use factor of gallons per employee day (gped), based on historical use records. The other method uses industrial projections in terms of units of production, with a use factor based on gallons per unit of production (gpup), also based on past records.

As with municipal demand projections, industrial projections must be disaggregated, if not available, for smaller areas. Generally, a county level would be adequate and some such projections may be available from local and state planning groups.

In addition, a problem arises from the fact that data on past industrial water usage are rather scant. The Census Bureau conducts a Census of Industrial Water Use. The published data are on too broad a scale for use, but the Bureau is undertaking to compile the data in more detail. Data on water use can be furnished by Standard Industrial Classification (SIC) number, for counties where disclosure regulations permit, and at least for multi-county planning areas.[29]

Projections of industrial water use are probably the most difficult part of the study due to the rapid technological changes in industrial

processes that can and do occur. Some of the important variables which influence water use rates are: (1) product manufactured, (2) manufacturing processes, (3) amount of production, (4) rate of production, (5) cost of water supply, and (6) cost of waste water disposal.

Water Quality Control. The purpose of the economic base study, regarding water quality, is to project the waste water volume and characteristics. These are functions of the water supply demand which, as just discussed, is a function of population and industrial growth projections. The percentage of municipal demand which is returned to streams as waste water flow is not expected to vary appreciably in the near future. Therefore, return flows will be obtained by applying present return flow percentages to projected municipal demands.

Projecting industrial return flows is more difficult and encounters the same type of problems as projecting industrial demand. Rapid technological changes cannot be foreseen. Reclaiming of wastes and recycling of water will probably increase as water quality control efforts are increased. Also, information on return flows is often not readily available or it varies widely. For example, plants producing identical products have been observed to have widely differing water use patterns and return flow quality, due partly to such factors as different operating practices, availability of water, and geographical location. Some present return flow data can be obtained from the Bureau of Census, and a number of studies have been made for specific industries. The programs of water quality control agencies in the United States and Canada should be able to provide waste characteristics of certain industries.

Interpretation of Economic Data

Some of the problems of interpreting the available economic data and information have been discussed in this chapter. This recapitulation suggests more precise guidelines for an information system to use in its interpretation function.

It has been pointed out that much information is available from a number of sources, notably the federal census bureaus of both countries. However, this information has been collected for general use by many diverse users. Before it can be useful to any one agency, careful consideration must be given to interpretation and evaluation.

One of the first problems in interpretation is the deficiency of available data. In spite of the tremendous amounts of information gathered, the wide range of interests preclude the general purpose data collection agencies meeting the needs of every specific user, such as a water resource agency. The information system must identify the information needed specifically for water resources planning and management and assume the responsibility for its collection. Some of these types of information have been identified. Even when the desired types of information are available, deficiencies in the detail of the data often exist. Census bureaus in both countries have recently made efforts to provide information in more detail than has been previously available but disclosure regulations may present a problem if and when greater detail is required. Projections of economic information, such as those by the Office of Business Economics and Economic Research Service (OBERS) program use methods which are not capable of providing sufficient detail. It is readily conceded that the more specific projections are, the less accuracy

can be expected; but attempts should be made to develop methods for more detailed projections. Possibly a range of expected conditions would be more valuable than one dubious projection.

Much of the information available and needed by the Operations Office has been analyzed to some extent. The methods of analysis used are sometimes controversial. The value of this information must be determined by economists, planners, and others who are capable of examining the methods and assumptions used in the analysis. Again, the projection of economic and demographic data presents real problems. Even without considering the problems of detail discussed above, projections of a more general nature are often doubtful because of a lack of consideration of the dynamic factors involved. Often simple extrapolation of past trends is used. While such unknowns as governmental policies and technological and social developments are difficult to include, some consideration should be given to them. Here again, possibly a range of projections should be produced based on varying assumptions associated with individual factors. This gets very complex indeed. Interpretation of data will rely heavily on the computer.

Proper interpretation of available information considering questions such as those just discussed must be done by the users of the information who should have the expertise required for such interpretation and evaluation. This again emphasizes the need for direct involvement of the users in the design and operation of the information system.

Summation

From this chapter on economic information, a number of considerations stand out that have implications for the information system of the Operations Office. Some of these implications are as follows.

The following tasks are being performed by existing agencies with the required resources and will not be major tasks for the office:

(1) Raw data collection and storage;

(2) General analysis of data, including aggregation and disaggregation, relationships among variables, projections of economic activities, and plans for desired economic development; and

(3) Development of user-oriented computerized services for specific analyses.

The office will be concerned with the following:

(1) Filling important gaps in basic data related to water and land resources;

(2) Obtaining information from existing sources and further analyzing as necessary for use;

(3) Coordination with other information and planning agencies, such as specifying needed information not being gathered, providing specific information on water and land resources, and insuring that resource management fits into policy frameworks to guide and control economic development and growth;

(4) Providing a "referral" service for other resource agencies by informing them of sources of economic information, the types of information available, formats, and means of obtaining it; and

(5) Performing, sponsoring, and collecting research to apply economic concepts to water and land resources, such as deriving demand functions, measuring benefits, and developing models of economic growth which show the role of resources.

REFERENCES AND FOOTNOTES

Case Study I

Economic Data and Information

[1]Erie-Niagara Basin Regional Water Resources Planning and Development Board, Plan of Cooperative Study for Comprehensive Water Resources Development (1964).

[2]The discussion on descriptive inventories is drawn from Sewell, et. al., Water Management Research: Social Sciences Priorities. Policy and Planning Branch, Department of Energy, Mines and Resources, Ottawa, 1969, p. 18.

[3]F. P. Linaweaver, Jr., et. al., "Summary Report on the Residential Water Use Research Project", Journal of the American Water Works Association, Vol. 59, No. 3, (March, 1967), pp. 267-281.

[4]United States Bureau of the Census, Fact Finder for the Nation (Washington: Government Printing Office, 1957). See Otto Eckstein, Water Resource Development: The Economics of Project Evaluation, Harvard University Press, 1958. See also the works of E.J. Mishan, Arthur Maas and Paul Davidson.

[5]U.S. Office of Statistical Standards, Bureau of the Budget, Statistical Services of the United States Government (Washington: Government Printing Office, Revised Edition, 1968), pp. 3-14.

[6]Id., pp. 7-8.

[7]U.S. Bureau of the Census, 1970 Census Users' Guide (Washington: Government Printing Office, 1970), p. 5.

[8]U.S. Bureau of the Census, Census Bureau Programs and Publications: Area and Subject Guide (Washington: Government Printing Office, 1968).

[9]U.S. Bureau of the Census, Guide to Census Bureau Data Files and Special Tabulations (Washington: Government Printing Office).

[10]New York State Office of Statistical Coordination, Division of the Budget, New York State Statistical Yearbook, 1971, Albany, 1971.

[11]New York State Office of Planning Coordination, New York State Development Plan--1, Albany, 1971.

[12]New York State Office of Planning Coordination, Central New York Regional Economic Study, 2 Vols., Vol. 1, Albany, 1969.

[13]Id., Vol. 2.

[14]New York State Office of Planning Coordination, Community Profile No. 5 - Central New York Planning Region, Albany, 1969.

[15]S. Ananda Rao, The New York State Land Use and Natural Resources Inventory, Water Resources and Marine Sciences Center, Cornell University, Ithaca, New York 1972.

[16]New York State Office of Planning Coordination, Planning for Development in New York State, revised, Albany, 1971, p. 8.

[17]N.Y. Office of Planning Coordination, N.Y. Development Plan-1, op. cit., pp. 6, 83-95.

[18]Id.

[19]E. Weatherhead, "Geocoding - A Technique in the Development of Urban Information Systems", Ontario Economic Review, Vol. 8, No. 5 (September/October, 1970), pp. 4-12.

[20]Canadian Department of Forestry and Rural Development, The Canada Land Inventory (Ottawa: 1966).

[21]Richard S. Thoman, Design for Development in Ontario: The Initiation of a Regional Planning Program (Toronto: Allister Typesetting and Graphics, 1971)

[22]Id., pp. 1-2.

[23]Id., pp. 29-32.

[24]Id., pp. 48-50.

[25]Ontario Regional Development Branch of the Treasury Department, Lake Ontario Region: 1968 (Toronto: 1968), p. iii.

[26]Great Lakes Basin Commission, Great Lakes Basin Framework Study - Appendix No. 19, Economic and Demographic Studies (1970), pp. 19-II-2.

[27]See for example, N.Y. Office of Planning Coordination, Central N.Y. Regional Economic Study, op. cit., Vol. II.

[28]Unless otherwise noted, the methods on municipal and industrial water demands and water quality control needs are from the Federal Water Pollution Control Administration.

[29]For an explanation of SIC, see United States Bureau of the Budget, Office of Statistical Standards, Standard Industrial Classification Manual (Washington: Government Printing Office, 1967).

CHAPTER VIb

CASE STUDY: WATER QUALITY DATA AND INFORMATION

Introduction

For the purposes of illustration, the Great Lakes Water Quality Office, a joint arrangement of the United States and Canada established by the 1972 Great Lakes Water Quality Agreement, can be considered as an embryonic operations office. The Water Quality Office, which is located in Windsor, Ontario, has, as part of its mission, the responsibility to monitor, assess, and report on progress made in achieving the goals of the Water Quality Agreement. The Office is now involved in the collection of water quality data and information, identification of needed research, public information and, to some degree, the development of public participation in its processes and similar activities. Although its primary concern is presently water quality of the lower lakes, the arrangement is useful in the present context as a prototype in developing a joint office for multi-purpose management of the Great Lakes.

This case study itself is limited to one function, data and information; however, the possibility of joining other functions with the water quality task in the future should be kept in mind.

Water Quality Goals and Standards

The information requirements for a water quality control function are determined by the particular social goals which the two countries, acting in a coordinated way, establish for the Great Lakes. These goals, of course, change over time, causing corresponding modifications in the information requirements.

An excellent and fairly recent illustration of the relationship between social goals and the determination of information requirements is the 1970 report on the IJC sponsored study of pollution of Lake Erie, Lake Ontario and the international section of the St. Lawrence River[1] and the resultant 1972 Great Lakes Water Quality Agreement. In the 1970 report the social goals with regard to Great Lakes water quality are embodied in five General Objectives. They are:

> "The receiving waters of Lake Erie, Lake Ontario, the International Section of the Saint Lawrence River and the connecting channels of the Great Lakes at all places and at all times should be:
>
> (a) Free from substances attributable to municipal, industrial, or other discharges that will settle to form putrescent or otherwise objectionable sludge deposits, or that will adversely affect aquatic life or waterfowl.
>
> (b) Free from floating debris, oil, scum and other floating materials attributable to municipal, industrial or other discharges in amounts sufficient to be unsightly or deleterious.
>
> (c) Free from materials attributable to municipal, industrial or other discharges producing color, odor or other conditions in such a degree as to create a nuisance.
>
> (d) Free from substances attributable to municipal, industrial, or other discharges in concentrations that are toxic or harmful to human, animal or aquatic life.
>
> (e) Free from nutrients derived from municipal, industrial and agricultural sources in concentrations that create nuisance growths of aquatic weeds and algae.
>
> Furthermore, no substances should be introduced into these waters unless reasonable efforts have been made to ensure that it will not lead to the violation of any of the foregoing objectives."

The IJC report goes on to list nine Specific Objectives and defines them as "the desirable levels of water quality considered necessary at this time (1970) to achieve the General Objectives." The Specific Objectives are, in effect, water quality standards. They are as follows:

(a) Microbiology (Coliform Group). The geometric mean of not less than five samples taken over not more than a 30-day period shall not exceed 1,000/100 ml. total coliforms, nor 200/100 ml. fecal coliforms in local waters.

(b) Dissolved Oxygen. In the connecting channels and in the upper waters of the lakes not less than 6.0 mg/l at any time; in the hypolimnetic waters not less than the concentrations necessary for the support of fishlife, particularly cold water species.

(c) Total Dissolved Solids. Less than 200 mg/l in Lake Erie, Lake Ontario and the International Section of the St. Lawrence River; in the St. Marys River, pending results of a study of the Upper Great Lakes, a level of total dissolved solids not exceeding that of 1970; and in the other connecting channels a level consistent with maintaining the levels of total dissolved solids in Lake Erie and Lake Ontario less than 200 mg/l.

(d) Temperature. No change which would adversely affect any local or general use of these waters.

(e) Taste and Odor. No objectionable taste or odor. Phenols desirably absent but not to exceed a monthly average of 0.001 mg/l. Other taste and odor producing substances absent.

(f) pH. No change from the present range of levels, 6.7 to 8.5.

(g) Iron. Less than 0.3 mg/l.

(h) Phosphorus. Concentrations limited to the extent necessary to prevent nuisance growths of algae, weeds, and slimes which are or may become injurious to any beneficial water use.

(i) Radioactivity. Elimination of radioactive materials to the extent necessary to prevent harmful effects on health. Pending the adoption of more stringent limits, in no event is gross beta activity to exceed 1,000 pCi/l, Radium -226 not to exceed 3 pCi/l and Strontium -90 not to exceed 10 pCi/l.

As stated in the report, these foregoing Objectives are "intended to be the minimum basis for formulating provincial and state water quality standards and meaningful programmes to achieve the desirable levels of water quality."[2] In addition, the report states that "the Commission does not condone degradation of waters which now have a quality superior to that envisaged by the Objectives."[3]

This set of water quality objectives as well as the recommended institutional modifications required to help realize them were submitted to the two governments for approval. These Objectives, with very slight changes, were incorporated into the Great Lakes Water Quality Agreement

executed in April 1972. A clear statement of goals and water quality standards such as this provides essential guidance to the joint organization charged with coordinating the implementation of the Great Lakes Water Quality Agreement. If the IJC and the Water Quality Board were transformed along the lines postulated in this volume, these same Objectives, perhaps with some modifications, would serve equally well. In this setting they would determine in large measure the information needs of the new organization insofar as water quality is concerned.

The translation of social goals into standards is a controversial and technically difficult exercise. Standards are expressed in quantitative terms reflecting not only what is technically possible or correct but also what is economically, socially and politically feasible. To establish these standards, there must be some weighing and balancing of the costs against the benefits from various levels of improvement of water quality. The costs of water quality control can not be measured with great precision but can be estimated with sufficient accuracy for most policy-setting purposes. Estimates have been made of the costs involved to various industrial activities in meeting certain standards, for example, The Cost of Clean Water a series of reports published in 1968 by the Federal Water Pollution Control Administration, predecessor agency of the EPA.[4] Most studies in the past have been concerned with the costs of wastewater treatment but in recent years more attention has been focused on the comprehensive economic impact of proposed water pollution abatement programs.

These cost and benefit assessments are extremely difficult to do with a satisfying degree of precision. The state of the art is still

pretty rudimentary. Some of the basic problems include: (1) gaps in our knowledge of the links between cause and effect, e.g., dramatic episodes such as massive fish kills are easily recognized but often the true cause of such events cannot be determined even in extensive retrospective studies; (2) the challenge of detecting, understanding, and then preventing the more subtle, long-term effects of pollution, e.g., the accumulation of substances such as mercury in fish tissue and the effects of this on the food chain; and (3) the fact that many effects, even if understood, seem to defy quantification, such as aesthetic enjoyment and preserving the functioning of natural ecosystems.

However, there is general agreement that some action must be taken to improve the quality of the water, thus human judgment and intuition must be relied upon where knowledge fails us. Water quality standards involve a balancing of benefits and costs by a mixture of knowledge and judgment. Indeed, most of the controversy in the field of water resources management arises from the use of value judgments of costs and benefits.

Most water quality control programs now include water quality standards as the basic legal tool. These standards set desirable and permissible threshold limits on specific chemical and physical characteristics of the receiving stream or body of water. They may also include requirements such as non-degradation of existing water quality and minimum levels of wastewater treatment.

The most pressing need for information is in the field of basic research to establish criteria and then standards for water quality. After standards have been set, an extensive stream monitoring system is

needed to spot violations. Stream monitoring is also required to establish water quality baselines and trends. Assessment of changes in water quality are the most effective means of evaluating the effectiveness of water quality management programs.

In addition to stream monitoring, individual waste discharges must be inventoried and monitored. This is necessary to enable treatment plant operators to maintain optimum treatment efficiencies, to maintain a current knowledge of wastes entering each water body, and to assess the individual effects of each waste source on the waters into which wastes are discharged. Often in conjunction with stream standards are other requirements such as a uniform degree of treatment. Also, when stream standards are not being met, corrective actions by control agencies must be based on considerations of the quantity and quality of individual dischargers and their costs of waste treatment and other means of waste discharge reduction.

Water Quality Information Requirements

The types of information needed for control of water quality include: (1) standards by which the quality relative to use can be judged, (2) monitoring of existing water quality based on the parameters included in the criteria and standards, (3) inventory of waste discharges, including quantity and nature of individual waste discharges, and (4) economic information on costs of waste discharge reduction or elimination for individual sources.

The setting of standards is primarily a problem of basic research, including both scientific and socio-economic considerations. The IJC report as mentioned above, recommended water quality standards (Specific

Objectives) for the lower Great Lakes and the international section of the St. Lawrence River. These do not apply in areas of proximity to outfalls where mixing zones must be studied. It is stated in the report that these parameters are intentionally limited to those believed to be most meaningful in relation to IJC responsibilities. These objectives are designed to protect the international waters for "all legitimate uses including the most restrictive."[5]

Monitoring of water quality represents the greatest problem in basic data collection and handling for water quality control. The Lake Ontario Basin contains more than 28,000 miles of rivers and streams and 700 square miles of rivers, lakes, and embayments, on the United States side alone.[6] In addition, Lake Ontario itself has a surface area of 7,520 square miles.[7] Obviously, there is no limit to the amount of data which could be accumulated on all of these streams and lakes. To make the most effective use of limited resources, careful consideration must be given to the number and location of stations, sampling frequencies, and parameters measured, to maintain the best coverage possible for control purposes and water quality baseline studies.

A sample of polluted water can contain many chemical and biological constituents. Some of these are valuable indicators of water quality while others serve only as troublesome interferences in other analyses. The first consideration for monitoring is to select those parameters required to characterize the sample, considering the past history of the water body and the planned or desired uses. The Environmental Protection Agency's computerized storage and retrieval system for water quality (STORET) data can list 425 water quality parameters but only a limited

number (usually less than 20) are required or possible at any single sampling station.[8] Decisions regarding which parameters to omit are just as important as which ones to include. Unnecessary determinations not only add nothing of value but waste valuable time and resources which could be used for more frequent analyses or important characteristics.

The parameters used to describe water quality are of two main types--basic water quality characteristics and specific waste constituents. The specific constituents are those chemical substances which in themselves are undesirable or at least potentially so. Water quality characteristics are not undesirable constituents but indicate effects on the quality in various ways and include such things as biological oxygen demand, temperature, and alkalinity. For example, biological oxygen demand is important as an indicator of the amount of dissolved oxygen that will be used while the waste is being degraded. Certain coliform organisms are measured as indicators for pathogenic organisms.

For the purposes of enforcing standards, the extreme values are of greater concern than averages. To guarantee full compliance would require continuous sampling and analysis of all of the indices of quality. Since the cost of this at all stations would be prohibitive, practical sampling frequencies should be based on the following:[9]

-- the particular index of quality requiring the most frequent evaluation;

-- the importance of the water uses being protected at the location and the impact of a violation on these uses;

-- the potential for brief violations to occur.

Many of the parameters of water quality can vary greatly over a relatively short time period such as the diurnal variation of dissolved oxygen or sudden industrial spills and accidental discharges. The need for in situ, automatic, continuous monitoring is apparent. Since the basic goal is the control of water quality rather than mere measurement, the use of monitoring equipment to sound an alarm or even to automatically initiate action by control mechanisms should be an essential part of the monitoring concept. Another great need for continuous data is research to determine relationships between various parameters to evaluate the efficacy of control activities.

There are a number of limitations on automatic monitors which limit their use at the present time. One major concern is the cost. Not only do the instruments themselves cost money but they require routine maintenance by generally higher salaried personnel than are required for manual sample collection. The number of parameters presently measurable by such means is rather limited. Also, a vast amount of data is generated, some of which may not be necessary, and which may require more elaborate and expensive data handling procedures. Nevertheless, the prospect of keeping a continuous check on the vital signs of a stream is an attractive prospect and has created a growing interest.

An example of an automated system of monitoring is the Ohio River Valley Water Sanitation Commission (ORSANCO) system installed in 1960. In this arrangement automated monitoring complements manual monitoring. In 1968 the electronic component of the system consisted of 14 field stations, a central receiving station, and a data display and storage system. The robot-monitor units are equipped with transmitters for

telemetering data to headquarters by means of a leased telephone-wire circuit. Each electronic field station has multiple analyzer units which use sensors for measuring: pH, oxidation-reduction potential (ORP), chlorides, dissolved oxygen (DO), specific conductance, temperature, and solar radiation. Not all measurements are made at each station. ORP is included at some stations on an experimental basis to determine any correlation between the state of chemical oxidation or reduction and water quality conditions. ORSANCO headquarters automatically interrogates the robot-monitor units once each hour and receives data on conditions as they are being measured at that moment. Data is automatically punched on paper tape for use by the computer.[10]

Current Data Collection Activities

The current water quality data collection efforts in the Lake Ontario Basin are focused on: (1) stream monitoring; (2) lake surveys; and (3) inventories of wastewater treatment facilities and other point sources.

A. Stream Monitoring

United States-Federal. In 1964, United States Bureau of the Budget Circular A-67 directed the Department of the Interior to coordinate water data acquisition activities of Federal agencies. To carry out this mission, the Office of Water Data Coordination was established within the Interior Department's Geological Survey (USGS). Certain state agencies, municipal agencies, and private organizations also participate in the program. No effort was made by the office to contact all non-Federal agencies. An attempt was made to contact those agencies most active in water data acquisition in their state, thus obtaining extensive,

although not necessarily complete coverage. Some of the agencies contacted indicated they would be willing to participate but were unable to do so because of manpower limitations.[11]

The Office of Water Data Coordination does not collect or store the actual data - these must be obtained from the reporting agencies. One of the responsibilities of the office is to maintain a Catalog of Information on Water Data. One section of this catalog is the Index to Water Quality Section. The catalog is a file of information about water data acquisition activities. This information is available on media suitable for data processing, supplemented by microforms and station-location maps. The Index to Water Quality Section contains: (1) identification and location of stations; (2) major types of data collected; (3) period of record of collection; (4) frequency of data collection; (5) in what form the data are stored; and (6) agencies reporting the data.

The Budget Circular also contains guidelines for developing a national network to acquire water data. In the field of water quality, plans for integrated state-federal water quality monitoring systems for a number of Environmental Protection Agency regions have been developed and are being implemented.[12] The nationwide water quality surveillance system will use existing programs of the EPA, state pollution control agencies, and other Federal water data collection agencies, principally the United States Geological Survey. To coordinate and evaluate water quality data, the EPA has developed its STORET (acronym for STOrage and RETrieval) system. This system, with a computer in Washington, D. C., provides a central repository for all water quality and related data collected by EPA. The system is still being developed and several Federal and state agencies

are currently supplying and receiving data. The data collected are entered in the central computer on a daily and weekly basis by remote terminals in all EPA regions. The remote terminals can also be used to obtain timely information from the central computer.

The data stored in the STORET system include water quality data, municipal and industrial waste facility inventory, water quality standards compliance, fish kill, oil spill, construction cost, and other related information. This large data base can be drawn on for raw data in printed form. Data can also be retrieved in statistically analyzed form. Calculations can be provided of monthly and annual averages and trends, comparisons between results at different sampling stations, and correlations between such different water quality parameters as dissolved oxygen, waste load, and temperature. Also available are other types of analyses such as comparison of water quality to Federal-state standards and digital plotting of data and maps. The parameters measured at long-term water quality stations by the Environmental Protection Agency in the Lake Ontario Basin are shown in Table 5.

New York State. The New York State Department of Environmental Conservation operates a water quality surveillance program which could ultimately develop into the major source of water quality data on the United States side of Lake Ontario. The primary objective is to evaluate existing water pollution abatement activities and determine their effects upon water quality. To meet this objective the program is designed to:

--Acquire, evaluate, and disseminate information on the quality of water for and from the varied local, state,

Table 5

Water Quality Parameters Measured by the
Environmental Protection Agency
(Lake Ontario Basin Office)

Chemistry

1. Water Temperature
2. pH
3. Specific Conductance
4. Alkalinity
5. Turbidity
6. Dissolved Oxygen
7. BOD*
8. COD
9. $N\text{-}NH_3$
10. $N\text{-}NO_3$
11. N-Organic
12. Phosphates
13. Solids
14. Chlorides
15. Sulfates
16. SiO_2
17. Magnesium
18. Iron*
19. Calcium

Biology

Benthic Fauna
Phytoplankton
Chlorophyll

Microbiology

Coliform
Fecal Strep
Fecal Coliform

Special - Federal Water Quality Monitoring Network Station

Pesticides
Toxic Metals
Trace elements
Radioactivity
Potassium
Sodium

*Not measured at all stations

Source: Letter of January 24, 1972 from Robert L. Flint, Jr., Environmental Protection Agency, Rochester, New York.

inter-state, and Federal agencies together with educational, commercial, industrial, and individual entities.

--Determine the long-term trend and variation of water quality.

--Provide a rapid intelligence system for the preservation of the waters and the protection of the water users, including compliance with water quality standards.[13]

The program has four components: manual surveillance, automatic surveillance, aerial surveillance, and public surveillance. The stations for manual surveillance were selected to represent the general quality of the water in a given river drainage basin and to indicate the effects upon this quality from upstream waste discharges. Manual surveillance is currently conducted at approximately 200 water sampling stations of which about 80 are operated by other agencies, municipalities, and industries. Only two of the stations are in Lake Ontario, but there is a large number in the Lake Ontario drainage basin. Sampling frequency was initially set at an arbitrary frequency of one sample per month. This frequency was then varied depending upon the location. A sampling frequency of two times per month is generally used immediately downstream of point sources of pollution where major pollution problems were found to exist. Several stations located on lakes are sampled only two or four times per year. Selected stations are sampled at other frequencies for BOD_5, microorganisms, phenols, radioactivity, oil, fluorides, heavy metals, pesticides, and other toxic materials. The parameters routinely measured include: alkalinity, ammonia nitrogen, chlorides, COD, coliforms conductivity, hardness, iron, manganese, nitrates, nitrites, organic nitrogen, phosphates, sodium, sulfates and suspended solids.

The automatic surveillance component of the program is intended to detect promptly undesirable conditions; verify and provide a basis for improvement of stream survey evaluations and predictive models; and show water quality trends for program management and public information purposes. The criteria established for locating the automatic monitors are:

-- The water quality and/or quantity at the site fluctuates rapidly;

-- Site is in an area where there is a high potential for accidental spills of various wastes; and

-- The site allows continuous evaluation of response of the stream system.[14]

The major automatic monitors measure the following water and air parameters: hydrogen ion concentration (pH), dissolved chloride concentration, dissolved oxygen concentration, dissolved fluoride concentration, conductivity, water temperature, turbidity, water stage height, solar radiation intensity, and air temperature. The minor monitors are essentially the same as the major monitors except that they measure less than the ten parameters listed above and do not have their own shelter. Satellite monitors are small, compact, and battery powered and transmit the data via radio to the major monitor. They measure only a small number of parameters and are used when it is impractical to install a major monitor or to measure certain parameters at the site of a major monitor. The Department of Environmental Conservation has proposed a total of 36 major monitors, 4 minor monitors, and 83 satellite monitors by 1976. None of these are in Lake Ontario.[15]

Aerial surveillance is used on a limited scale. The two forms of aerial surveillance are aerial photography and remote sensing. Aerial photography uses both true color and false color infrared film and often can produce more information than can be contained in numerical measurements. The true color film can show the presence of deleterious materials such as suspended and floating solids and oils. False color infrared film can indicate the presence of aquatic vegetation and algae. Remote sensing includes quantitative airborne thermal imaging and radiometry to detect temperature characteristics of the water, and ultraviolet scanning to detect oil. Numerical and pictorial data are obtained.

Of necessity, the formal water quality surveillance program cannot adequately cover all the waters in the state subject to pollution. To enlist the aid of the public, a "Water Watchers" program was established. Individuals interested in pollution control are requested to take note of and report any unusual events occurring in the waters. A "water watcher" may report an event by calling collect the Water Quality Surveillance Section.

Canada. In Canada, the agency primarily responsible for water pollution control is the recently created Office of Water Management, in the Ontario Ministry of the Environment. This office was formerly the Ontario Water Resources Commission. A routine monitoring program was begun in 1964 and by 1970 had expanded to include sampling at 650 locations on 137 rivers and at 2,000 locations on the Great Lakes and connecting channels. Automated collection (remote monitoring) was conducted at two locations but neither of these was in the Lake Ontario Basin. Annual publications of collected data are released to interested parties.[16]

The bulk of computer processing is done on a computer located at the Ontario Department of Highways. The design of a Water Quality Information System was completed in 1970. Storage and retrieval segments of the Water Quality Monitoring system have been developed and programs are being written and tested to process water quality data gathered from survey work on the Great Lakes.[17]

B. Lake Surveys

The information sources cited so far have been concerned primarily with monitoring of water quality in streams. There are several additional information sources which are concerned with water quality in Lake Ontario itself. Data collection in the lake has been mainly done for research purposes, whereas stream monitoring is usually concerned more with locating and controlling pollution sources.[18]

One source of such information is the United States National Oceanic and Atmospheric Administration (NOAA) of the Department of Commerce. That agency absorbed the United States Lake Survey from the U.S. Army Corps of Engineers in 1970. Data have been obtained in the past from periodic surveys conducted by research vessels, but studies are underway to establish continuous monitoring stations. Projects have been started to compile available data pertaining to chemical and physical properties of the water, evaluate the data, and collect supplementary data where serious data deficiencies exist. The assembled data are placed on cards in a standardized format for computer processing, handling, and correlation. Research projects are coordinated with the Environmental Protection Agency and Canadian agencies.[19] NOAA has also acted as the lead agency in carrying out the missions assigned to the International Field Year on the Great Lakes and the management of the gathered data.

The Canada Centre for Inland Waters (CCIW) is the major Federal interdisciplinary water resources research institute in Canada. The Centre's initial programs have been directed toward research in the Great Lakes and it has available a research vessel. A full year of chemical monitoring data was accumulated for Lake Ontario in monthly cruises starting in April 1969 and ending in March 1970. After cruises, preliminary charts of surface distribution of temperature, dissolved oxygen content, conductivity, and turbidity are made up and distributed

to interested individuals and agencies. The regular full chemistry monitoring cruises include analyses for orthophosphate, soluble reactive silica, nitrates, nitrites, ammonia, total alkalinity, specific conductance, turbidity, dissolved oxygen, pH, total phosphate, total organic nitrogen, and 20 other specific metals and elements including mercury. Most of these analyses were conducted on only a limited number of samples.[20] Computer programs are being developed to facilitate retrieval and analysis of cruise data and the data is in a form available for retrieval, sorting, and statistical testing by a variety of computer programs.[21]

C. Inventory of Waste Discharges and Treatment Facilities

In addition to water quality data, detailed knowledge of waste discharges including those of wastewater treatment facilities is also necessary to develop and implement programs for water quality control. Reasonably good information is available on municipal wastewater contributions. On a national scale, the EPA completed the processing and analysis of data on municipal waste treatment facilities during 1969 and has published the inventory. Because of the need for timely and accurate data, procedures have been developed for bringing this inventory up-to-date and keeping it current.[22] Information contained in the inventory includes the location of the facility, place (stream, lake, land, etc.) of wastewater discharge, population served, daily flow, type of treatment, population equivalent of BOD (for untreated and discharged water), treatment needs, and remarks.[23]

Unfortunately, there does not exist any such nationwide inventory of industrial waste sources. Plans have been made by the Environmental

Protection Agency to initiate an inventory of wastewater discharges in industrial manufacturing and processing plants. Initially, this will be an agency effort and will eventually be expanded to a joint EPA-state cooperative project. The EPA STORET system will be used to store and evaluate the data. Some information on industrial waste discharges is available from STORET now. In addition, the new permit system required of all discharges under the 1972 Amendments to the Federal Water Pollution Control Act will provide expanded information on industrial inventories.

In Canada, the Ministry of the Environment, in carrying out its industrial pollution control program, regularly surveys all sources of industrial pollution and prepares reports describing the quantity and quality of the discharges. The status of pollution control at each industry is assessed and appropriate remedial measures are recommended where required to bring effluent quality in line with the government objectives. Problems associated with discharges of industrial wastes to municipal sewers are also investigated.

The office also has the task of reviewing and certifying engineering plans from industry where the effluent from the proposed waste treatment works is to be discharged into a water course. Because of this regulatory function, the emphasis of survey activities has shifted. Since a growing percentage of waste discharge programs have been reviewed and approved, there are less in-depth surveys required to identify problems. Potential pollution problems are now being identified and corrected before they are created and there is an increasing emphasis

on routine surveillance visits and unannounced spot checks to insure that treatment plants are operated as approved.[24]

Fortunately, there is available a considerable amount of information about pollution of Lake Ontario and Lake Erie from point sources. In 1960, the Congress of the United States appropriated funds to launch a comprehensive pollution study of the Great Lakes. Actual studies of Lake Erie began in 1963, and of Lake Ontario and the international section of the Saint Lawrence River in 1964. The research and technical data work was begun by the Department of Health, Education, and Welfare and after reorganization, continued by the Department of the Interior. These departments were responsible for water pollution control activities before the creation of the Environmental Protection Agency in 1970.

These studies were used in preparing the report Pollution of Lake Erie, Lake Ontario, and the International Section of the Saint Lawrence River of the International Joint Commission in 1969.[25] In Canada, studies of the lower Great Lakes for this report began in 1964, after water pollution became a matter of reference to the IJC by the two governments. The Department of National Health and Welfare, the Department of Energy, Mines and Resources, the Fisheries Research Board of Canada, and the Ontario Water Resources Commission all initiated programs to develop data on which to base recommendations for the necessary remedial action on the two lakes.

One of the important results of these studies in the present context is the identification and characterization of sources of wastes

being discharged into Lake Ontario and the Saint Lawrence River. Of primary importance here are industrial and municipal wastes. Other sources studied include shipping, dredging, sediment accumulation, and atmospheric sources.

Figure 3 shows the location of major municipal, industrial and tributary waste loadings on Lake Ontario and the Saint Lawrence River. The list of municipal and industrial dischargers and the characteristics of their wastes is too long to be reproduced here. The major pollutants of municipal wastes are biochemical oxygen demand (BOD_5), chlorides, phosphorus, and nitrogen. The municipal loadings include waste waters from both domestic populations and industries connected to municipal sewerage systems. About one third of the industries in the Lake Ontario basin are connected to municipal sewerage systems.

The characteristics of industrial wastes are quite varied. Those parameters most commonly measured are: biochemical oxygen demand (BOD_5), suspended solids, total nitrogen, total phosphorus, and chlorides. Other important parameters peculiar to specific industries may include acids, alkalis, oil, phenols, cyanide, and iron. Pesticides and herbicides and other synthetic organic chemicals such as polychlorinated biphenyls (PCB) are also of increasing concern. There is also the problem of massive and continuous discharges of heated coolant water from power generating facilities in the Toronto area and also at Rochester and Oswego.

The oxygen demanding wastes are degraded by natural biological activity in the lake and streams but many of the substances and nutrients are not degraded and may produce a lasting effect on the lake. Several indicators of water quality were studied in the lake, to indicate the zones of influence of the pollution loads.

Figure 3

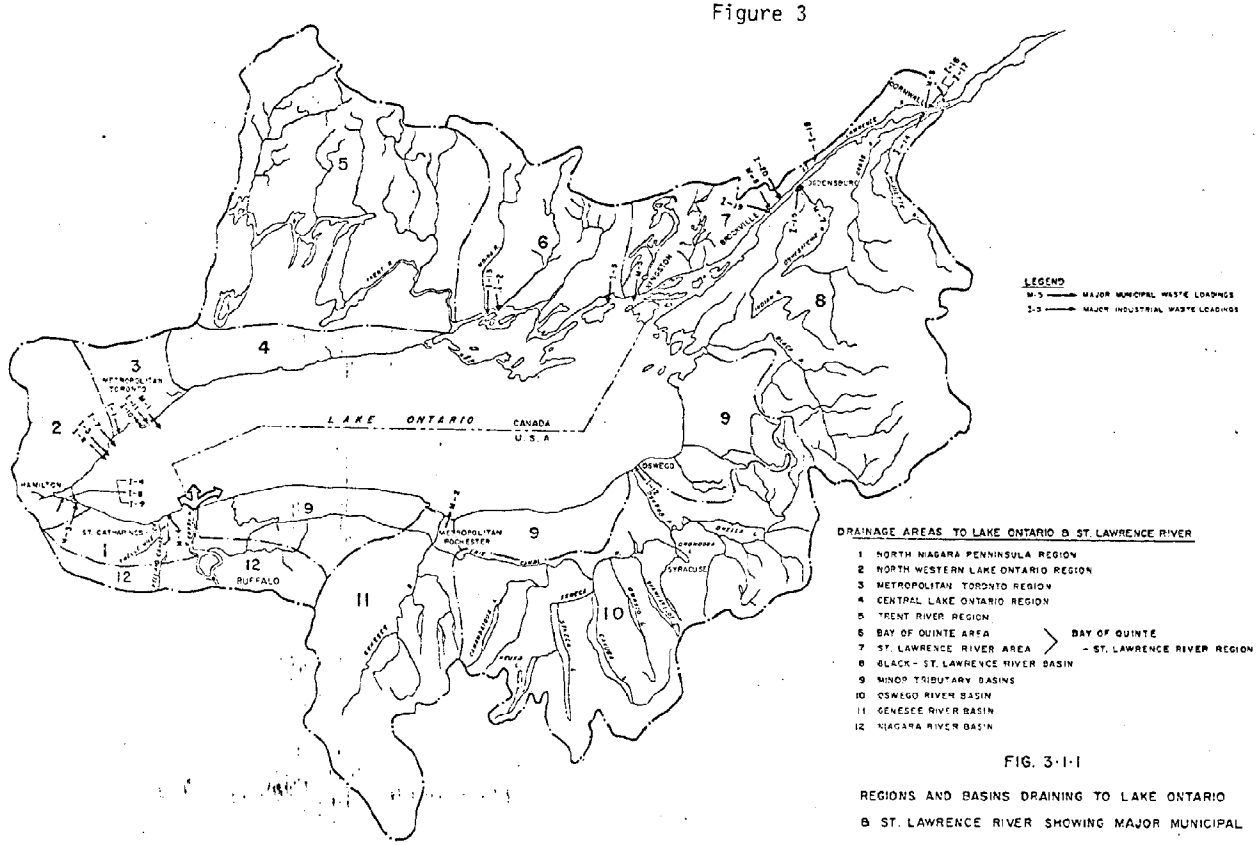


FIG. 3·1·1

REGIONS AND BASINS DRAINING TO LAKE ONTARIO & ST. LAWRENCE RIVER SHOWING MAJOR MUNICIPAL AND INDUSTRIAL WASTE LOADINGS.

Fig. 3.1.1 Sources and location of major municipal, industrial and tributary waste loadings to Lake Ontario and the St. Lawrence River.

Interpretation of Water Quality Data

As the amount of data collected on water quality increases, especially as continuous monitoring becomes more prevalent, methods for interpreting and analyzing the data will become more complex. The use of an electronic computer to sort out these data will become an unavoidable necessity.

The ORSANCO monitoring system provides an example of the problems of data interpretation. With 14 automatic field monitors, the amount of data collected is so great that manual processing becomes physically and economically impossible. To summarize manually the data collected during one year, showing daily averages, maxima and minima for all quality characteristics at all stations, it has been estimated, would require 150 man-years. The system can produce more than 650,000 items of data per year, but something less than this is actually received due to technical difficulties and erroneous items. If these were corrected, the amount of data to be processed would increase 15-25% over that now received.[26]

The first task in the processing of the data is editing and validating. This is necessary because of the possibility of instrument error or equipment malfunction. A number of tests have been established for validating the data and can be performed by the computer. About 99% of the decisions on acceptance or rejection of data are made automatically. The remaining 1% must rest on personal judgment.[27]

To facilitate retrieval of monitoring information, the stations must be indexed on a geographical location basis. The STORET system uses a hydrologic index and geographical coordinates (latitude-longitude).[28] The hydrologic index locates a station on a defined river system and thus allows sorting and retrieval of data records in relation to direction and level of stream flow. Hydrologically indexed

data are retrieved by specifying the beginning and ending indexes of the stream to be studied. Retrieval of information in hydrologic order can be useful, for example, in tracing a contaminant downstream. Geographical coordinates can be used for large open bodies of water and locations which cannot be readily associated with points on a stream. Other advantages are that it avoids the complex river-mile-index coding and provides a rapid and familiar method of defining station locations. Data are retrieved for this method by giving the coordinates of the vertices of the polygon and polygons.

The computer can handle and deal with the tremendous number of individual data items but the human mind cannot comprehend these data without methods of interpretation and aggregation. There are a number of ways in which water quality data are currently interpreted and evaluated. Standard mathematical characterization of the data include such calculations as summaries of average, maximum, and minimum values of a certain parameter over time, and statistical evaluations include such things as frequencies of occurence of values and percent of time certain values are exceeded. These types of interpretation basically relate quality conditions to time.

Graphical displays of data are valuable in relating quality conditions to time and especially in exploring geographical relationships. Geographical relationships are especially valuable in water quality control due to the movement of pollutants by river flow. The ORSANCO staff uses an interesting graph called a qualigram which shows quality data plotted in terms of frequency of occurrence and geographical location. This device provides a means of weighing actual stream conditions against an established objective for it shows at a

glance the percent of time the objective is met. Also by overlaying graphs for different years, conditions over time can be determined, allowing an evaluation of progress being made by control programs.[29] The STORET system is capable of digital plotting of data and maps.[30]

Both the ORSANCO staff and the New York Department of Environmental Conservation have shown interest in index numbers as a means of a quick reference system of water quality status. An index number represents the composite influence of various parameters weighted according to their importance. Such indices should be devised so that parameters well above requirements cannot override deficiencies of other parameters.[31, 32]

Interpretation, including data presentation, is a vital part of assessing water quality conditions. It is in this aspect of effort that the Federal agencies concerned with water quality surveillance have been lagging.

Water quality surveillance programs and waste discharge inventories are objective, desirable methods for assessing the quality of water. However, it must be recognized that data deficiencies and the difficulty of quantitatively defining all pollution problems may require supplemental methods of assessment. Narrative summaries, backed up where feasible by tables and charts can fill gaps left by other methods by allowing subjective expressions for local areas by expert field personnel of various agencies. This method could include information on such indicators as agency appropriations, expenditures, administrative and regulatory action, enforcement hearings and suits. It can also include information on problems not adequately covered by other methods, such as fish kills, heat, aquatic plant growth, and groundwater pollution.

In spite of the large quantities of water quality data existing in various locations, it is still difficult to gain an understanding of the nature and extent of the water quality problem. This is due largely to the physical complexity of the problem as well as lack of interpretation and reporting. The variability of many characteristics require continuous monitoring; yet the cost of continuous monitoring precludes its extensive use. Also, the geographical variability should require many more station locations than are presently used. The lack of adequate data is a serious problem in assessing existing or past conditions.

The lack of knowledge of industrial wastes is another serious information deficiency. Only by understanding all the causes of the water quality problem can effective solutions be hoped for.

In assessing water quality, especially for the benefit of the public, the available data must be compared with some standard to give meaning to the data. State and Federal stream standards are obvious and logical standards of comparison. But this comparison can present problems. For example, which of the many characteristics are most important, how often are the standards violated, by how much are the standards violated, and at how many points on the stream are the standards violated?

One approach might be to use the index number concept discussed previously to weight the various characteristics of water quality according to their importance for the water use. Measurements of all the characteristics at one location at a particular time could be combined into one index number. A frequency curve of index numbers

similar to a flow duration curve could be drawn at each station and criteria developed to classify the water quality at the station. The criteria should take into account both magnitude and frequency of occurrence of the index numbers and would depend on the use of the water. It might be allowable, for example, for some uses to have low quality water at infrequent intervals, but for other uses even infrequent low quality conditions might be unacceptable. The criteria could be used to classify the water as simply low, medium, or high or a numerical rating scale might be used. A map showing the classified quality of streams and water bodies could be drawn and when overlayed with a map showing water requirements, could identify problem areas.

As discussed in the framework for developing an information system, certain uses of information such as public information, policy-making, and to a certain extent, planning, may require information in a highly interpreted, narrative format. This narrative may be supplemented by easily understood figures, numbers, and pictorial presentations. Ease of understanding is an important consideration and, especially in the case of public information, attracting the interest of the user of the information. The information presented should include an assessment of water quality conditions, trends, results of programs, and options for the future.

A good example of the type of public reporting needed is the article of the National Geographic on the restoration of the Williamette River in Oregon.[33] With attractive, impressive pictures and a well-written text, this type of article can attract the reader's interest

and inform him in an interesting, enjoyable, and thorough (for his purposes) manner. As opposed to the more technical reports of many water agencies, this type of reporting may present less data but more information--in the sense that information is data that are meaningful to the user.

Implications for the Information System

There are a number of agencies and groups collecting basic water quality data in the Lake Ontario region. Several of these are relatively comprehensive and well organized systems, including such things as automatic monitoring and computerized storage and retrieval. One of the first tasks of the information system is to assess the existing information for such factors as its quality, availability, comprehensiveness, and suitability for the purposes of the Operations Office. Lines of communication for transferral of such routine, technical information should be relatively easy to establish, possibly by remote computer terminals.

However, due to the scope of the surveillance problem, there is practically no limit to the amount of data which could be collected on the many miles of streams and lakes. There will probably be gaps in coverage which the Operations Office will fill in by collecting the data or sponsoring such collection by others. This is especially true in the lake area itself. Other types of information such as industrial waste inventories are not as readily available and may have to be collected by the information system of the Office. Even when information is collected by the Office it may be desirable to use an existing system (or systems) such as the Environmental Protection Agency's

STORET system for storage and processing of the data. This could help to avoid the need for a large and costly computer operation for the information system.

The causes of water quality control problems are generally local in nature. Control functions are decentralized, both by geography and authority. Also, problems requiring immediate action, such as standards violations, fish kills, and accidental spills of toxic materials, can occur very quickly. All of these factors emphasize the need for a communication network to rapidly receive information from many sources, interpret it, and disseminate it to many users. Procedures will have to be established well in advance of any crisis situations and means of rapid communication such as the telephone, teletypes, and remote computer terminals will have to be used.

The large quantities of basic data collected, the complexity of using all this data to assess and control water quality, and the many different users involved, require that interpretation and reporting of information be a vital task of the information system. Uses of the information will vary from scientific research which requires detailed, technical data, to public information which will require highly aggregated, summarized, and interpreted information. A wide range of methods of interpretation and reporting will be required to satisfy the variety of users.

REFERENCES AND FOOTNOTES

CHAPTER Vb

Case Study: Water Quality Data and Information

[1] International Joint Commission, Pollution of Lake Erie, Lake Ontario and the International Section of the St. Lawrence River, a Report to the IJC by the International Lake Erie Water Pollution Board and the International Lake Ontario-St. Lawrence River Water Pollution Board, 3 volumes, 1969.

[2] Ibid.

[3] Ibid.

[4] Federal Water Pollution Control Administration, (FWPCA), The Cost of Clean Water (Washington: Government Printing Office, 1968).

[5] International Joint Commission, op. cit.

[6] Great Lakes Basin Commission (GLBC), Great Lakes Basin Framework Study Appendix No. 1, Basin Description, (1971), pp. 169-175.

[7] Encyclopedia Britannica, 1968 Edition, Vol. 16, p. 973.

[8] Dwight G. Ballinger, "Automated Water Quality Monitoring" in Environmental Science and Technology, Vol. 2, No. 8 (August 1968), pp. 606-610.

[9] William T. Sayers, "Water Quality Surveillance: The Federal-State Network" in Environmental Science and Technology, Vol. 5, No. 2 (February 1971), pp. 114-119.

[10] William Klein, et. al., "An Integrated Monitoring System for Water Quality Management in the Ohio Valley," in Environmental Science and Technology, Vol. 2, No. 10 (October 1968), pp. 764-771.

[11] Office of Water Data Coordination, Catalog of Information on Water Data - Index to Water Quality Section (Washington: U.S. Geological Survey, 1970 edition), p. 1.

[12] U.S. Federal Water Quality Administration, Clean Water for the 1970's, op. cit., p. 52.

[13]New York State Department of Environmental Conservation, Water Quality Surveillance in New York State (1970), p. 1.

[14]Ibid, p. 6.

[15]Ibid.

[16]Ontario Water Resources Commission, 1970 Annual Report (Toronto: 1971), pp. 66-68.

[17]Ibid., p. 14.

[18]One exception to this is the joint IJC investigation (1964-1969) of pollution of the lower lakes and the international section of the St. Lawrence River (refer to note 1).

[19]United States Lake Survey, Army Corps of Engineers, Great Lakes Research Center: 1970 Program (Detroit: 1965), pp. 29-32.

[20]Canada Center for Inland Water, Canada Center for Inland Water - 1970, Department of Fisheries and Forestry (Ottawa: Information Canada, 1971), pp. 29-30.

[21]Ibid., pp. 4, 16.

[22]F.W.Q.A., Clean Water for the 1970's, op. cit., p. 53.

[23]United States Environmental Protection Agency, 1968 Inventory of Municipal Waste Facilities, 10 Volumes (Washington: Government Printing Office, 1971).

[24]Ontario Water Resources Commission, op. cit., p. 28.

[25]IJC, op. cit., Note 1.

[26]Klein, op. cit., p. 767.

[27]Ibid.

[28]Environmental Protection Agency, Storage and Retrieval of Water Quality Data (Training Manual), pp. 3-1 through 4-1.

[29]Klein, op. cit., p. 768.

[30]E.P.A., Storage and Retrieval of Water Quality Data, op. cit., p. 1-1.

[31]Klein, op. cit., p. 768.

[32]N.Y.S. Department of Environmental Conservation, op. cit., p. 13.

[33]Ethel A. Starbird, "A River Restored: Oregon's Williamette" in National Geographic, Vol. 141, No. 6 (June, 1972), pp. 816-835.

CHAPTER VII

PUBLIC PARTICIPATION*

Introduction

Public participation refers to activities of private citizens or groups of citizens in trying to influence decision-making. Direct participation of the public in governmental decision-making processes is neither a new concept nor an unprecedented practice. Canada and the United States have nurtured the principles of participatory democracy from the time of their birth as nations. These two nations have open systems that allow dissension and criticism and promote citizen involvement in many areas of decision-making. These two democracies constitute a social experiment in which the governments and the people endeavor to solve the complex problems of modern society in the face of financial resources that always seem inadequate and with public institutions that always seem better suited to address the problems of the past rather than those of the present or future.

What is new about the concept of public participation is a heightened interest in it on the part of the public and a marked shift from its previous focus of application at the local level to the state, provincial and, particularly, the federal level. A reaction is now taking place in response to the continually growing power of the federal governments and their increasing capacity to

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*Based in part on a master's thesis by Arivd L. Thomsen entitled, Public Participation in Water and Land Management, Cornell University, 1973.

affect the everyday lives of citizens. Much of the new interest in direct intervention was brought about by abuses committed by policy-makers who heretofore operated without effective restraint simply because the public ignored or abdicated its responsibilities. The situation in recent years has been radically altered. People are demanding a say in how their natural resources are to be used. The public, when convinced that activities are proceeding in an improper direction, has been successful in stopping those activities or at least changing their direction. The Florida Barge Canal controversy in the United States and the Spadina Expressway controversy in Canada are excellent examples of effective citizen intervention.

The trend is clearly toward more citizen participation. Governmental agencies are now moving to deal with this phenomenon. Agency guidelines are being revised, public hearings are being treated by agencies with more seriousness and new legislation is being drafted to permit citizens to seek relief directly against the government in the courts. Public intervention in the planning process reduces misapprehension, softens what might otherwise be hardened viewpoints and facilitates the resolution of differences.[1] It can also tie things up in knots. The challenge of the public administrator is to find a way to ensure that consideration of public viewpoints do not impede the decision-making process. "Public participation does not transfer the authority and duty for making decisions from those entrusted by law with that responsibility to those who are eager to participate."[2]

Public participation is here with us to stay. The mechanisms to promote, sustain and guide it must be built into the new joint

organization. Public participation must have standing equal to the research task and the information system of the new organization. These three major functions should be mutually reinforcing, each drawing strength from the other two. If these three functions (research, information system, public participation) are planned and managed with skill, their interaction would be synergistic. It is from this triad of functions that the new organization derives its viability, independence and identity.

This chapter is in two sections. The first provides a framework of considerations useful in the development of a public participation program. The discussion is in general terms. The second section illustrates how these considerations might be applied in the context of the postulated new organization for the Great Lakes region.

General Considerations in Developing a Public Transportation Program

The primary assumption underlying efforts to involve the public in water and land management is that it is an effective means of including social considerations in management decisions. The effectiveness of this means of embodying social issues in decision-making is yet to be proven and is still debated. The concept of public participation has long been given lip service but its application in any meaningful way is yet to be tested. Furthermore, because each region is unique in terms of its resource-mix and its people there is no single best approach to the organization of public participation programs. As a result, attempts to involve the public in decision-making have to be viewed for the time being as experimental with constant re-evaluation of an integral

part of these attempts. The success of these experimental attempts will be determined to a great extent by the flexibility of approach and the degree to which these programs are integrated with the entire decision-making process.

Organization of public participation programs should be developed around three main program functions: (1) educating the public, (2) educating the agency and (3) public and agency interaction and dialogue. These functions are interrelated and the success of any one depends upon the success of the others.

A. Public Participation Functions

Educating the Public. Informing or educating the public is a continuous process inherent in any public participation activity. One objective of this kind of activity is a better-informed public. The dissemination of the right information to the right people at the right time is a most important prerequisite to an effective public participation effort. It is also important to remember that this is but one function of a public participation program. Too often agency attempts to improve citizen involvement have been simply attempts to provide better information to the public. This is only one part but an important one of public participation programs.

Although the scope of public information may initially be considered infinite, potential subjects can be separated into three categories:[3] substantive, organizational and procedural. The need for substantive information is obvious. If the public is to play some role in decision-making, it must acquire varying degrees of knowledge about the problem, possible solutions, trade-offs, and implications of various management strategies.

Less apparent is the need for information concerning the organizations involved in management, their organizational and decision-making structures and their legal and potential scope of management. This is especially important because of the present fragmented nature of resource planning and management. Local people often become confused because of the overlapping of or the apparent (and real) gaps in responsibilities. Good intergovernmental and interagency relations, together with public information that identifies these relationships and responsibilities to the degree possible, is necessary to reduce confusion, legitimize the management process and promote public interest and participation.

Closely related is the need for procedural information. Participants must know not only about the public involvement processes but about the processes of management as well. Information concerning the processes of identifying goals, planning, deciding (including initiation, choice and ratification), developing and allocating resources, executing and evaluating should be presented so that the hopes and expectations of participants are kept in a perspective that will minimize disappointment and discouragement.

In an impact study of power projects in Schoharie County, New York, 61 percent of the public responding to a survey indicated that they needed more information. Warner's survey of public participants indicated that 57 percent of the participants needed more information than has been available in the past.[4] The need for more information ranked third as a change needed to increase the effectiveness of public participation. Specifically, the respondents indicated the information should be more widely circulated, increased in amount, more understandable, more basic in nature, used to identify conflicting viewpoints, and more explicit in identifying and explaining assumptions. Some respondents indicated that the information usually received was too complex, others claimed it was too simplistic. This result illustrates the need for flexibility in disseminating information. Information must be prepared and packaged differently for different groups depending upon their own characteristics and needs.

Communications experts must become acquainted with the relevant publics and then supply the wide range of needed information in varying degrees of completeness and technical detail depending upon the receiving public and the time relative to the decision-making process.

Educating the Agency. Before useful information can be obtained from the public the first function of public participation must be effective, i.e., the public must be well-informed. Failure to adequately inform the public can be a source of failure in attempts to determine public values, needs and desires. Public hearings are widely criticized on this basis. Questionnaires and other survey methods lose much of their potential value if the responses are from uninformed people.

Assuming an informed public, there are still many problems in eliciting and using public response. Finley and Hickey found that three major factors tended to alienate the public in the Susquehanna Basin:[5]

> "1. Filling the agenda so that reactive groups must wait several meetings to present their views.
>
> 2. Failure to seriously consider the views of the reactive groups.
>
> 3. Taking a generally negative attitude toward any position of the reactive groups because of the source and not because of the substance of the position."

Yet, the Susquehanna Coordinating Committee considered generation of public response the most important objective of the public participation program that they initiated.[6]

Warner's survey of government administrators and planners indicated that more public feedback and reaction to proposals was a major goal of public participation programs. In the same survey, these respondents rated the value of information produced by public participation very low.[7] These two examples indicate that techniques for collecting useful information from the public are not well-developed. Therefore an experimental approach with qualified communications professionals may be a prerequisite to obtaining useful information from the public. This information can be obtained by asking, infering from behavior or by psychological tests. All of these methods require special professional competence for design, implementation and interpretation. This competence must be acquired if any management agency is serious about implementing a public participation program.

It is important to point out that in most cases today the public is likely to respond or react at some time or another. If this response is effectively elicited at the proper time, mutual accommodation or innovative conflict may result.[8] However, if this response is not obtained by some kind of design it is likely to be spontaneous with a lack of proper information leading to disintegrative conflict.[9]

Dialogue. The third function of a public participation program is to establish a dialogue or two-way communication between the agency and the public. This function appears to be the major thrust of many recent public participation programs. The first two functions of public and agency education become supportive and a part of the two-way communication efforts. Perhaps this thrust is a result of the recognition of the difficulties and ineffectiveness of simply informing the public or obtaining public response to proposals. Another possible reason is the realization that informing the public and obtaining information from the public is an iterative process. The public finds it difficult to respond without proposals to respond to and has little motivation to respond when a study is completed and one plan or proposal is presented.

Thus, the concept of working with the public rather than for it has emerged. Another factor that favors the third function is that the public is demanding a more direct relationship with the management agency. Warner's survey of potential participants indicated that whereas the past roles of these respondents were mainly as observers or independent reviewers, their desired roles included participation in the formulation of objectives, recommendations and alternatives. In other words, the public desires and in some cases demands that it be provided the opportunity to react to a process rather than a final plan.

The rationale for concentrated efforts to establish a two-way flow of communication in public participation programs is evident in a statement by Tabita:[10] "In the final analysis, success in accomplishing the mission will rest more than ever on making the public a member of the team. We can no longer afford the mechanisms for achieving public rapport used in the past. Old methods must be improved and new methods developed and total reliance should not be placed on any one system or set of tools for reaching and retaining the public's sympathetic interest. In view of the developing possibility of vocal, special interest groups obscuring the best public interests, it is vital that the public be informed at every level of possible concern, that it be supplied with all of the facts necessary for intelligent decision and that its cooperation in every step of the planning process be secured."

B. Tasks and Activities

Programmed public participation is not operational until the objectives are translated into specific tasks and activities. This is the difficult practical problem confronted by agency personnel. Since issues and people vary in nature from place to place and time to time, program design is the heart of the experimental approach to public participation. Specific issues and people together with available resources will determine the scope and nature of the public participation program and the relationship of the agency and the people.

Regardless of whether the public participation effort is minimal or an elaborate program is attempted, there are four major activities in the design and implementation of a public participation program.

These activities are: (1) identification of the publics, (2) timing the involvement relative to the decision-making process, (3) selection of communication mechanisms, and (4) continuous evaluation and adjustment.

Identification of the Public. Just as there is no single "public interest" no matter how small the problem, neither is there a single identifiable public. The public as referred to in public participation and in the context of the Great Lakes Basin actually includes a conglomeration of interests that change with the issues and over time.

While statistical descriptions of the public in terms of such dimensions as age, economic status, education, professional interest, etc. is useful in two of the major functions of a public participation program (educating the public and educating the agency), the identification of the public to become involved in the third function, dialogue, is a far more complex process. Obviously, public information can be disseminated widely and public opinion can be elicited on a rather broad basis but the dialogue function is severely restricted as to the number of people that can become involved. Also a great deal of interest, motivation and commitment is required of the public participating in the dialogue function.

As a result, it is sufficient to identify only the influentials. Influentials are those individuals or groups having a potential for, reputation of, or record of influencing decision-making on the issue of concern or related issues. Wengert contends that the identification of influentials is static and fails to deal with those who are not influential but have a definite stake in the results of the decisions.[11] This criticism can be softened if the word "potential" is interpreted

liberally in the identification process. Working outside of organizations or cutting across organizational lines has not been too successful, probably because those who desire to participate prefer to become involved through an organization, if there is one, that represents their point of view on a particular issue. Also, it is a vain hope with the usual resources and time constraints to organize the unorganized on any kind of community or regional basis.

Three techniques have been proposed for identifying community leaders. These techniques are easily adapted to identifying individuals and groups that ought to participate in water and land management decisions. They are the positional approach, the reputational approach and the decisional approach.

The "positional approach" is used to identify individuals and groups who are in a position to be affected by or to affect decision-making. Organized special interest groups, universities, local planning groups, active citizen committees, local planners, industrial and business officials, flood plain residents, etc. can be identified on a positional basis.

The "reputational approach" consists of asking informants to name and rank community influentials. The informants can be selected panel or a random sample of community members. Public agencies involved in the area are often valuable informants on influentials. The snowball technique can also be used. In this technique all those identified are asked to act as "informers" as well in identifying other influentials. The process is continued until no new influentials are identified in the interviews.

The "decisional approach" is also known as the "event analysis" or "issue" approach. It involves tracing the actions of groups and individuals in regard to decision-making and policy formulation within the context of specific issues. Tracing may be done by gathering data from extensive interviews, from attendance at committee and organizational meetings, from reports, records of public hearings, speeches, news articles, etc. This approach tends to identify overt power rather than power potential or perceived power and recognizes influence as a process rather than as a static fixture.

Each approach in itself appears inadequate.[12] Regardless of the extensiveness of the identification process, a combination of the three approaches should be used in the process of identifying participants. When the list is completed it serves as a complete list for the dissemination of information and a list of potential respondents to agency questions. The list also serves as a source for identifying those who might best represent the public in the dialogue function and may help indicate the likelihood that any group or individual will make the required commitment. It may help identify potential conflict situations and problems of representation that must be solved by the agency.

The original list must not be considered final. Identification of participants has to be a continuing process. Attitudes and opinions are likely to change as awareness and knowledge of the management problems and alternative solutions are increased through the public participation program.

Combining the three approaches creates the possibility of many degrees of sophistication and systemization of the identification process.

Groups and individuals identified in each approach can be ranked or graded regarding their representativeness, degree of organization, legitimacy, visibility, scope of influence, etc. Decisions can be made regarding who should be informed, who should be interviewed and who should be invited to participate directly in dialogue with the management agency.

Timing of Involvement. Once the participants have been identified the next task is to determine the points in the decision process when the public can and should be involved. Two primary timing concerns are the initiation of involvement and the frequency of involvement. In Warner's survey of private groups involved in agency planning studies, the 143 respondents ranked timing of involvement opportunities second in importance in needed improvements to allow more effective participation.[13] These respondents stressed the need for early and frequent public participation throughout the decision making process. The public needs to be involved early so that they can participate in the formulation of objectives, recommendations and alternatives rather than simply react to agency determined plans, often with insufficient time to adequately consider the proposals.

The Susquehanna Communication - Participation Study has been cited as an innovative attempt to involve the public in decision-making.[14] The lack of success experienced here was to a great degree a result of beginning the program with only 1 1/2 years of the six-year study period remaining.

Frequency of involvement is usually related to natural review points in the particular decision process. Although each issue

situation will be somewhat unique in this respect, there are five points in general where there is something to present to the public and something for them to react to:

1. Formulation of Goals and Objectives.
2. Results of Technical Studies.
3. Formulation of Alternatives.
4. Evaluation of Alternatives.
5. Presentation of Final Plan.

Involving the public in the formulation of goals and objectives is important because it provides the opportunity to establish good working relationships at the conceptual stage. Agreement is more likely here because of the absence of the necessity of commitment. It allows the public and the agency to get to know and understand one another which is important throughout the public participation and decision-making process.

Maintaining public involvement through the technical studies is likely to provide three potentially valuable results:[15]

1. Acquisition of a broader spectrum of data;
2. Verification of assembled data; and
3. Reinforcement of relationship with public.

Local technical people can be especially valuable in this phase.

Public participation in formulating and evaluating alternatives relates primarily to the dialogue function of public participation programs. Public input in this phase will expand the range of alternatives, develop a better understanding of feasibilities, develop a better understanding of the complexity of the problems including the

required trade-offs and promote and reinforce relationships established in earlier phases.

Presentation of the final plan is primarily an information function. However, access must be provided for dissenting arguments. If the participation program has been successful in earlier phases there should be minimum dissent at this point. However, those who preferred not to participate until this point or who feel left out may respond.

There may be times during the decision process when considerable time elapses between major involvement points, e.g. during technical studies or while awaiting agency review or political ratification. During these times it is important to maintain relationships through the informing function by reporting on progress and agency processes even though there is very little progress.

Selection of Communication Mechanisms. Effective participation of all interests is only possible if the management agency is successful in providing adequate communication links with and between the participants. Because of the diversity in participants and the relatively different kinds of information transmitted at various times in the decision process a variety of mechanisms may be necessary for effective participation. This is one reason why identification of participants and determination of timing are important first steps in implementing a public participation program.

Although many of the mechanisms for public involvement are multiple purpose in nature, each can be classified according to its primary functional use. Some mechanisms are particularly useful for educating the public while others provide useful information for the agency. Still

others provide the opportunity for agency-participant dialogue. Many mechanisms are complementary to the successful utilization of others. For instance, those mechamisms used to inform the public quite obviously complement attempts to obtain qualified information from the public and efforts to engage in informed dialogue.

Information is usually disseminated through public notices, newsletters, news media, a speakers bureau or published agency reports. Public notices usually contain terse, inconspicuous information concerning public meetings, hearings, etc. Newsletters can be published on a regular basis to provide specific controlled information and are distributed to individuals identified as potential participants. The news media include television, radio and the newspapers. Of these, the newspapers are often considered the most accessible, least expensive and most effective. A speakers bureau can be organized to provide speakers to clubs, schools or other organizations that regularly schedule guest speakers. Regular or especially prepared agency reports are also used to educate the public. In addition, public displays and films can be utilized.

Common techniques for information collection include surveys, public hearings, public inquiries and special study task forces. Surveys utilize various polling and interviewing techniques. Public hearings are the most widely used formal device for entertaining the views of all interests on a particular issue. Public inquiries are similar to public hearings except they are informal. Special study task forces may be established to investigate a particular issue and report to the management agency and the public.

Dialogue or two-way communication can be achieved by informal contacts, workshops, group advocates, advisory committees, formal meetings and informal meetings. Informal contacts are probably the most important since they are complementary to all other devices. Workshops are, as implied, work sessions where participants are encouraged to openly discuss issues and alternative actions. They are informal in nature, restricted to relatively small groups and may be conducted in a series. The group advocate technique requires interested groups to elect a representative to express their viewpoint and return pertinent information to the group. Advisory committees can be appointed to represent various interests, however they are usually selected and charged to represent the views and interests of the more general public. Its relationship to its constituents is different from that of the group advocate in that the advisory committee is usually (but not necessarily) appointed, not elected, and its constituents are not as well defined. Formal and informal meetings are useful for exchange of information. They differ from the workshops in that the development of ideas and alternative solutions to problems are not included as objectives.

Continuous Evaluation and Adjustment. Continuous evaluation and adjustment of all activities is an essential component of the responsive, experimental approach to public participation. Objective self-evaluation may be one of the most difficult of all the tasks. For this reason it is often desirable to secure outside observers, probably from a university, for this activity.

Since evaluation criteria have not been well-developed and in any case will not be easily defined, the evaluation itself is essentially experimental. As a starting point the program should be evaluated relative to its stated objectives with a view toward changing the objectives or adjusting the activities to make the two more compatible. Techniques should be developed for evaluating the success or benefits of the program in view of the resources committed on a marginal bases. Questions concerning organizational and structural deficiencies, representativeness of participants, responsiveness, flexibility, scope and specificity of participants, and interest motivation and maintenance must be considered.

When deficiencies are identified, alternative means of eliminating them should be developed. Those alternatives that cannot be adopted in the current program may be feasible in future public participation experiments. Thorough, continuous evaluation and corresponding adjustments in the processes will form the basis for long range success in public participation in water and land management.

A Public Participation Program in the Great Lakes Basin

The foregoing section developed a framework of considerations that those charged with designing a public participation program must take into account. This section examines some of those considerations and their associated assumptions in more specific detail and with special reference to the Great Lakes region.

As discussed in this and previous chapters, a fundamental assumption with respect to the new organization is that it would carry

out its treaty mandate in two basic modes of operation. They are: (1) independent or autonomous operations in which the new organization deals directly with citizens or groups of the public or private sectors; (2) an indirect role consisting mainly of facilitating the coordination of the planning and programmatic activities of existing public agencies of the region. This modus operandi suggests that a Great Lakes organization public participation program would consist of two distinct yet interrelated components. The first includes public participation activities undertaken directly with the public. The second concerns the organization's role in the public participation activities of existing government agencies with resource responsibilities in the Great Lakes region.

A. Activities of the Regional Agency

The new organization should develop its own relationship with the public for a number of reasons. Such an endeavor would enhance the agency's visibility and accountability and help to legitimize its mission. It would also promote an international, regional perspective and provide valuable information concerning the public's perception of the proper scope and function of a new joint organization.

This discussion of direct relationship public participation activities is pegged to three of the four major activities which were outlined in general form earlier in this chapter. They include: identification of public participants; determination of the proper timing of activities; and selection of communication mechanisms. The fourth activity, that of continuous evaluation and adjustment, is not included in the discussion.

Identification of Participants. Identification of potential public participants is never a simple task, especially in an area as large as the Great Lakes region. When a problem is confined to a small area the identification of public participants and the motivation of their involvement may involve only the usual problems. On a regional scale, however, it becomes more difficult to involve a significant portion of the public.

Although information should be disseminated as widely as possible and public feedback should be elicited from as large a cross section of the public as possible, most public participation activities of a regional nature will necessarily involve, more often then not, regional influentials. This as a frank recognition of things as they are. It does not imply that the organization should not exert every effort to encourage citizen involvement on the broadest scale, because it should. The idea is to raise the level of consciousness of people living in the Basin, imbuing them with a regional outlook and an understanding of the goals of the new organization. A very successful public participation program would be one in which this "regional outlook" is acquired by at a substantial sector, say one-half, of the region's citizens. With regard to active citizen participation, a much smaller percentage is envisioned for example, through organized groups possible 2 percent of the Basin population might fall within this category. Reliance must be placed on the leadership of such groups, i.e., the influentials. These leaders and influentials who have experienced and recognized the benefits of public participation and who are aware that change takes time are the only group likely to commit the necessary resources to

become involved. These people can be identified by using the positional, reputational, and decisional approaches as described earlier.

Potential participants identified by these approaches would include: the news media (including all radio and television stations and all newspapers in the region), universities, environmental organizations, public interest groups such as the League of Women Voters and various other citizen advisory committees concerned with regional problems. It may in fact be useful to organize a citizens' task force to assist in the identification of potential public participants.

This selection task can never be completed. As time passes and new problems and issues emerge new participants will appear while others will fade from the scene. Also, public participation activities can be expected to produce new leaders as members of the public become better informed of the problems of the region and of the potential for participation.

Timing. The two primary timing concerns are the initiation of involvement and the frequency of involvement. Frequency depends on the decision-making process and on the communication mechanism. Other than the recommendation that the public should be involved continuously as much as possible, further discussion regarding frequency is included in the section on communication mechanisms.

Public involvement must be initiated early. The reasons for this are : (1) the public normally requires a great deal of information to promote awareness and interest; (2) the public must be adequately informed if it is to play a useful role; and (3) it is easier to establish a good relationship among the various interests early when discussions concern concepts and there is time and opportunity for accommodation.

Communication Mechanisms. Although most communication mechanisms are multiple purpose, each can be classified according to its principal function. These three functions are: (1) to educate the public, (2) to educate the agency and (3) to promote dialogue between the agency and the public and within the public.

Educating the Public - A well-informed public can be the key to the success of a public participation program as well as a valuable assistance to successful resource management coordination. Information should include the structural and procedural as well as the substantive aspects of management.

Effective use of the news media has the potential of informing people at a lower per capita cost than any other mechanism. The new joint organization must establish a good rapport with the Canadian and U.S. television networks as well as the independent stations. Arrangements should be made to obtain maximum use of no cost or minimum cost public service programming opportunities available through the television medium.

Newspapers are probably the easiest to use and require the least commitment of financial resources. A series of articles prepared for newspaper dissemination might be undertaken. These articles might appear weekly in all of the region's major newspapers. In addition, articles on current management events should appear frequently, or at least weekly.

Newsletters can also be an effective mechanism for informing the public. Newsletters are currently published by regional agencies such as the Great Lakes Basin Commission and smaller regional agencies such as the Erie and Niagara Regional Planning Board. The first newsletters

should be distributed widely. A subscription form should be included in each issue for those wishing to remain on the mailing list and for suggestions concerning others who are likely to be interested. The subscription form should request information that will be useful in keeping the lists of subscribers current.

Agency reports should be described and summarized in newsletters and the availability of these reports should be clearly indicated. These reports should be made available to all interested parties upon request. Unavailability of agency reports is often a source of public alienation and distrust. In addition, all agency reports should include an introductory summary succinctly stating the objectives, major findings and conclusions of the report. This summary may satisfy the needs of many who otherwise would find it necessary to read the entire report. An annual report should also be prepared and distributed for public consumption.

Speakers' bureau activities are likely to reach few people and require too much of the agency's resources to be effective. However, other innovative activities could take its place. Movies and self-operating slide presentations should be prepared and advertised through the news media and the agency newsletters. Displays and posters can be located strategically. The Ontario Water Resources Commission (OWRC)[16] has had success in this public information technique and its experience might be drawn upon.[17]

Educating the Agency - An agency that is well-informed concerning the characteristics, values, opinions and needs of the public it serves will likely be more successful in implementing an effective public

participation program. Also, its management decisions will tend to be more responsive and command more public support. Although agency personnel will, in the course of things, come to know the public, it will, nonetheless, be useful for the agency to design certain aspects of its public participation program primarily to receive public input or feedback.

Public hearings and inquiries are appropriate for specific problems fairly local in nature. For the broader problems of regional management, surveys and citizen task forces may be more appropriate. Although the value of surveys is often questioned because results can depend on the way questions are asked and the interpretation of the raw data, surveys can play an important although limited role in informing the agency about its public. Surveys can also be included as part of other public participation activities such as identification of potential participants, newsletter subscriptions, workshops, etc. The potential for acquiring a great deal of information rather inexpensively and quickly in this manner should not be overlooked.

Citizen task forces can be formed to investigate the nontechnical side of almost any management problem. These task forces can be especially useful when dealing with social issues or social conflict. Task forces can be employed to assist in identifying potential participants, evaluation of the effectiveness of public participation programs and collecting survey data as well as mobilization of reaction to agency proposals.

Dialogue - At first glance it may seem apparent that there is little chance for dialogue between the agency and the publics in the management

of an area as large as the Great Lakes region except in specific localized problems. This challenge can be made less formidable with proper attention paid to some less obvious techniques which complement and even reinforce the methods already discussed.

An example is the importance of establishing good informal relations with as much of the public as possible. Many major newspapers in the region have writers that specialize in Great Lakes news. Frequent communication with these individuals, informal in nature, is a prerequisite in many cases to effective use of the newspapers for informing the public. Although these individuals should be asked to participate in as many programmed activities as possible, the informal relationship is likely to affect not only their interest in participating but the quality of information the public gets as well. Opportunities to make informal contacts or establish good informal relations with media representatives should never be neglected.

Workshops may be considered too limited in scope and too specific requiring too great a commitment of time and resources on the part of the public and the agency to be appropriate for an area the size of the Great Lakes region. Yet, Canada has initiated a nationwide series of workshops in which Canadians can participate in shaping guidelines for future resource development and conservation. This series is called "Man and Resources Conference." Each province has the freedom of implementing the program as it sees fit. Ontario has planned for initial discussions within existing citizen organizations. Next, a representative from each organization will attend a community workshop. Delegates selected from these workshops will attend regional workshops. Delegates

from the regional workshops will attend a provincial meeting. Following this provincial meeting, experts will analyze the alternatives identified by the series of workshops.

The highlight of the program, a national workshop, was held in November 1973* - the main purpose of setting guidelines for future policy and action.[18] There is potential for a similar program under the aegis of the new binational organization.

The Ontario approach to the Man and Resources Conference is a combination of the workshop mechanism and the use of group advocates. In an area the size of the Great Lakes region, the group advocate technique can be very useful. This technique is also compatible with the recommended combined method of identifying potential public participants. Those (groups or individuals) identified as most influential are likely to make up the core of the advocate system. The use of group advocates is effective in decentralizing the public participation program in a large region.

Citizen advisory committees can also be very effective when dealing with broad regional problems. Recognized leaders with a public-regarding ethos should be selected to serve on these advisory committees. These advisory committees can effectively participate in all phases of decision-making and in all phases of the public participation program. Individuals on these committees can provide important links with the public that can improve informal relationships. Individuals willing to serve on advisory committees must commit considerable personal resources to the effort. Therefore a policy of reimbursement for certain expenses should be considered.

*Reports of the worskhop were not available at the time of publication of this Reader.

Formal and informal meetings should be encouraged at all times throughout the region. Some of these meetings should be initiated by the agency, others will be organized by interested citizens. Educational materials and agency personnel should be available for use at these meetings. Communication is likely to be less restrained in this kind of forum than in some of the more formal activities. The unrestrained communication can lead to early recognition of conflict situations thus providing time for the agency and the public to obviate some of these conflicts.

B. Coordination of Domestic Agency Programs

It is a fundamental assumption of our organizational model that most of the present management activities will continue to be carried out by agencies of the governments in Canada and the United States and that the proposed new organization will attempt to coordinate those domestic agency activities that affect the Great Lakes region. Part of the new agency's public participation program should include surveillance, coordination and support of the public participation activities of the domestic agencies. This should help ensure a more representative regional approach to management in two important ways. First, the regional agency's efforts in evaluation and research and its experiences in communicating with the publics of both countries ought to complement and enhance the more specialized and limited public participation programs of the individual domestic agencies. Secondly, the increased awareness of the strengths and weaknesses of the domestic agencies' efforts resulting from the regional agency's (Operations Office) surveillance and coordination efforts

will aid in the refinement of the new organization's program and its useful integration into the organization's planning and decision-making process.

Four tasks are involved in the coordination of the domestic public participation programs: (1) surveillance; (2) evaluation; (3) research; and (4) reporting.

Surveillance. Identification of participating agencies and their functions is an obvious prerequisite for the new regional agency's coordination mission. This identification process should include a description of each agency's efforts in public involvement. Once this determination has been made, the communications and human behavior professionals of the new organization can begin examining the activities and experiences of the domestic agencies. This should not be a difficult task because in recent years most agencies require a detailed report on their own public participation activities for their own use.

Evaluation. Public participation experiences of the domestic agencies should be evaluated individually and in relation to the international, regional perspective promoted by the new organization. Special attention should be paid to duplicated efforts and possibilities for combining or integrating public participation programs of two or more agencies. Comparing the scope and specificity of involvement with the potential participants identified by the new regional agency may identify omissions in representation.

Warner suggests four types of evaluation criteria that might be included in a list of general performance criteria:[19]

1. To what extent does the program provide opportunities for members of the public who wish to participate to do so?
2. What efforts are being made to make the public aware of participation opportunities?
3. Is the public provided with adequate information for effective participation?
4. To what degree does the agency respond to the results of public participation efforts?

Techniques for evaluating the effectiveness of public participation programs are for the most part undeveloped. Evaluation efforts by the new regional agency working in cooperation with the domestic agencies and university consultants can begin to make some progress toward the development of effective evaluation techniques.

Research. Experience in evaluating public participation efforts of the domestic agencies as well as those of the new organization will serve to identify research needs. Research in communications and human behavior is often highly generalized. The operations of the new regional agency provide the opportunity for numerous, in depth case studies on related issues. Therefore, the activities of the new regional agency should be of great interest to students of communication and human behavior.

Once research needs have been identified, research activities should be initiated either by the new regional agency and the domestic agencies or through contractual arrangements with universities or other appropriate research oriented institutions.

Reporting. Extensive reporting on public participation coordinating activities should be directed in two ways: (1) to the domestic agencies; and (2) to the public.

If there is to be any hope for coordinating public participation activities of the domestic agencies, these agencies must be aware of the regional agency's mission and the international, regional perspective; experiences of other agencies; research activities and results and possibilities for coordination and integration of public participation activities. This can be accomplished by frequent reporting of the regional agency's activities and results.

Of equal importance is the reporting of public participation opportunities and the results of public participation efforts in the region. This reporting should foster the desired regional perspective among all the people who live and work in the Great Lakes Basin. Also, it will help recruit activist citizens by increasing awareness of opportunities to participate and by promoting a sense of achievement for those who do actively participate. This reporting of opportunities and accomplishments may also serve to eliminate some of the confusion that obtains when a number of specialized agencies of different levels of government take part in a large scale, coordinated effort.

Recapitulation

It is essential in any new institutional arrangement established by the two governments for improving the management of the water and related land resources of the Great Lakes region that the role of public participation be recognized and be made an integral part of such an arrangement.

In the new organization, the public participation program should be accorded the same priority as the research function and the information system. These three functions should mutually reinforce each other with synergistic effects.

The public participation program, as in the case of the organization's information system, should be centralized for program guidance, evaluation and reporting, yet decentralized in its implementation as much as possible.

The organization's public participation program should be conceived and developed as consisting of two separate but related areas of activity: (1) a direct relationship with the public; and (2) an indirect relationship through the monitoring, coordination and support of the public participation efforts of the domestic agencies.

Regional activities should be reported as widely as possible as one means of sustaining an effective public participation program.

REFERENCES AND FOOTNOTES - CHAPTER VII

[1] Katherine P. Warner, Public Participation in Water Resources Planning, a report prepared for the National Water Commission, National Technical Information Service, Springfield, Va., P.B. 204 245, pp. 127-129.

[2] National Water Commission, Water Policies for the Future, Final Report U.S. Government Printing Office: Washington, D. C. (June 1973), p. 373.

[3] Erie and Niagara Counties Regional Planning Board (ENCRPB), Citizens Information and Participation Program, June 1971, ENCRPB, Grand Island, New York.

[4] Warner, op. cit.

[5] James R. Finley and Anthony A. Hickey, A Study of Water Resource Public Decision-Making, Technical Report No. 37, Water Resources and Marine Sciences Center, Cornell Univeristy, Ithaca, New York, 1971.

[6] Thomas E. Barton, Katharine P. Warner and J. William Wenrich, The Susquehanna Communication - Participation Study, for the Institute for Water Resources, Clearinghouse for Federal Scientific and Technical Information, Springfield, Va., December 1970, p.

[7] Warner, op. cit.

[8] Morley Segal and A. Lee Fritschler, Policymaking in the Intergovernmental System: Emerging Patterns and a Typology of Relationships, paper delivered at the sixty-sixth annual meeting of the American Political Science Association, September 1970.

[9] Id.

[10] Angelo F. Tabita, Implication of Public Involvement in Water Resources Planning, Meeting Preprint 1627, ASCE National Water Resources Engineering Meeting, January 24-28, 1972, Atlanta Georgia.

[11] Norman Wengert, Public Participation in Water Planning: A Critique of Theory, Doctrine, and Practice, in Water Resource Bulletin, Vol. 7, No. 1, February 1971, pp. 26-32.

[12] For a more complete discussion of these approaches refer to: Charles M. Bonjean and David M. Olson, Community Leadership, in Perspectives on the American Community, Roland L. Warren (Ed); Chicago: Rand McNally and Company, 1969.

[13]Warner, op. cit.

[14]Barton, et al., op. cit.

[15]Id.

[16]As a result of the governmental reorganization in the Province of Ontario in 1972, the OWRC is now in the Ministry of Environment.

[17]See 1968 Annual Report of the Ontario Water Resources Commission (OWRC).

[18]Ontario Committee, Man and Resources Conference, An Invitation to the Future, a public information newsletter, February 25, 1972.

[19]Warner, op. cit.

CHAPTER VIII

THE LAKE ONTARIO FISHERY*

Introduction

The problem of fishery management has been identified as one of the major tasks of the new organization. The purpose of this chapter which examines the fisheries of the Lake Ontario Basin is to bring into sharper focus the range of problems and opportunities associated with the Great Lakes fisheries. The emphasis is on species succession and the factors which have influenced it as well as efforts undertaken to manage the Lake Ontario fisheries. In the context of the new organization, the problems of the fisheries would be the special concern of the Fishery Board.

The problems of the Lake Ontario fisheries are fairly representative of those of the other Great Lakes with the exception that the problems are more acute in the Lake Ontario Basin. The commercial fishery harvest of Lake Ontario has always been low in comparison with the other Great Lakes of North America, and the present day fishery must be considered the most impoverished of the five lakes.[1] Tendencies characteristic of eutrophication in the last 50 years have accompanied the markedly changing composition and abundance of plants and animals in the lake. Total aquatic production may have increased over the last several decades, but the quality of the harvestable production has decreased drastically.

The remnants of the once flourishing fishery business range from dying to modest to successful. Only a small portion (about 10%) of the

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*This chapter is based on a paper by Douglas M. Carlson, Management of the Biological Resources of the Lake Ontario Basin, 1972.

lake contributes to the harvest and the productive shoal areas are showing stress.[2] The future of this resource lies in the hands of the binational Great Lakes Fishery Commission and scores of private and public interests. Until the managers and harvesters come to agreement on policies and practices in using Lake Ontario, the fishery will continue in its relatively unproductive state or perhaps worsen.

Ecology of a Lake

Fishes in Lake Ontario are very important in the transport and conversion of energy in all regions of the lake. The initial input of energy is sunlight which is converted to plant tissue by photosynthesis (by producer organisms), to animal tissue by consumers, and perhaps then to another type of animal tissue by a carnivore. At any stage in this energy flow the organism can die and its tissues converted back to some of the original materials (nutrients) by bacteria and other decomposers. Conversion of light to plant tissue is restricted to the upper region of the lake called the euphotic zone. These plants, primarily algal diatoms in the open water region of the lake, eventually sink below the euphotic zone and die or are carried out of the euphotic zone by consumers (fish and zooplankton). Some animals living in the depths are dependent on this transported energy source. If these highly adapted species (fish) are removed from the system the energy cycle is slowed because much of the production is lost to the depths rather than being reconverted and transported to another region. This means over a fixed period of time the lake is less productive because the system which took eons of time to reach the highly adapted and efficient form of converting and transporting energy has been disturbed and perhaps permanently altered.

Many of the deepwater fish of Lake Ontario have been eliminated through disturbances caused by man. Species such as the burbot, lake trout, Atlantic salmon, deepwater sculpin, and some of the deepwater coregonid chubs are extinct or greatly reduced, and their niche in the deepwater portion of the aquatic environment, to a large extent, remains vacant. Other invader fish species have gained prominence in the Lake Ontario ecosystem. Some species such as lamprey, alewife and smelt have had competitive and predatory relationships with many of the native fish that were important to man, such as the lake trout, lake herring, and whitefish. Christie reports that in slightly more than 100 years the open water population of the lake trout, whitefish, and ciscoes have all disappeared, leaving the lake mainly populated with American smelt and alewifes.[3] The means by which the system can be restored to a portion of its original productivity of useful fish is dependent on an understanding of the biology and interactions of the fishes present and well coordinated programs of pest control, stocking and selective harvest.

History of the Fishery

The commercial fishery of Lake Ontario has followed the sequence of events somewhat similar to those which occurred during the collapse of the Lake Erie fishery, and the upper lakes have experienced similar problems in the last 40 years. Christie (1971) describes the changes in composition of the catch - a gradual loss of the highly valued species of Atlantic salmon, lake trout, ciscoes, and whitefish, and replacement with alewife, smelt, and white perch.[4] Man's earliest impact on the fishery were stream alterations in the 1800's. Construction of mills and dams

eliminated spawning areas of the Atlantic salmon. Intensive fishing with trap nets and gill nets took a heavy toll on whitefish, cisco, sturgeon, and lake trout. A maximum annual catch of 7.5 million pounds in 1890 was followed by a precipitous decline in the last 1890's. The lake trout and whitefish stocks came back to partial strength in the 1920's, but lake herring (cisco) stocks did not recover. Ciscoes remained in the harvest, but a different species, the bloater, had replaced some of the earlier deepwater forms. During the 1940's and early 1950's, the lake trout population dropped and fishing pressure concentrated on the whitefish, which soon became decimated and thus ended the open water fishery of Lake Ontario.

These population crashes were caused by a number of different factors, the complex of factors being different for each species. Christie speculates on the effects of competition and predation by marine invader fishes, overfishing, loss of spawning grounds and preferred food, and interrelated combinations of these factors on the important fish species.[5] The sea lamprey, an ancient jawless eel-like fish, and the alewife, a 6-8 inch hearring, entered Lake Ontario before 1900 (Table 6). The literature over the years has reflected active debate over the lamprey's colonization. If the lamprey was not a native of the fish fauna of Lake Ontario, which seems unlikely, then the colonization occurred before 1835.[6] The first catastrophic fishery collapse caused by lamprey predation (in combination with overfishing) occurred in the 1940's. The alewife became established in Lake Ontario in the 1870's after the completion of the New York Barge Canal (1829). This forage species was kept from entering the lake through the St. Lawrence River because of the piscivorous lake trout and Atlantic salmon.[7] This time lag between

Table 6

First Observation of Three Exotic Fishes in the Great Lakes

Lake	Year of First Record		
	Sea Lamprey	Alewife	Smelt
Ontario	?*	1873	1931
Erie	1921	1931	1935
Huron	1932	1933	1925
Michigan	1936	1949	1923
Superior	1946	1953	1930

*First problems caused by sea lampreys noted in the 1880's.

Source: Smith (ref. 7).

possible introduction and noted establishment is characteristic of invader fishes in man-made canals. A third invader species having great impact on the fishery was the American smelt which was probably placed in Lake Erie and became well-established in Lake Ontario by 1931.[8] There is an opposing theory that smelt were glacial relics being sustained in low numbers and not reported for many centuries. Other introduced species are rainbow trout, carp, and white perch.

Early 1900's

The species most important to the fishery prior to 1940 were lake trout, cisco and whitefish. Other species important for shorter time periods and in certain areas were lake sturgeon and Atlantic salmon, but both of these fisheries were extinct by the 1900's. The adult lake trout was tolerant of lamprey parasitism and intense fishing, but, according to Christie, the combined stresses of these factors often resulted in destruction of lake trout fishing in the 1940's because intense fishing reduced the average size of the slow-maturing trout to a size intolerant of lamprey attach at a time when lampreys were abundant.[9] Christie also attributes the extreme effect of lampreys on the fishery to the long life cycle of lamprey which results in delayed responses to environmental change, such as extreme reduction of the prey population (lake trout). Ciscoes were not as tolerant of intense exploitation. Continued harvest of these coregonids after the 1920's was possible because of a shift in species abundance. The bloater (a coregonid chub) made up a large portion of the catch of the 1930's. The whitefish, a planktivorous open-water coregonid, was turned to last by the fishery. As the intensity of

effort increased (partially due to improvement in gear, the nylon gill net), and an increase of the alewife, the whitefish stocks declined. The last stocks of whitefish subsisting in shoal areas were being carefully studied in the Bay of Quinte, but 1971 was the last year enough fish were available to provide data for statistical analysis.[10] The whitefish is the only species for which vital statistics have been studied in detail, and recent findings describe some regulators of population dynamics.[11]

1940 - 1960

Since the loss of the most valuable fish stocks in the 1940's occurred, the open water fishes have been dominated by the planktiverous alewife. The lamprey and overfishing had suppressed or destroyed the populations of larger fishes. Other fishes making short-term major contributions to the U. S. catch were carp in 1935-1939 and blue pike from the western region in 1952. Bullhead, perch, sunfish and eel comprised a minor fishery in shallow bay areas. Catches in Canadian waters were similar but with additional stocks of walleyes, channel catfish and northern pike. The burbot had been considered a nuisance fish through the decades of fishing because of its low commercial value and his susceptibility to gill netting. The burbot, like the lake trout, was important in terms of transporting energy from the deep regions of Lake Ontario, but the interactions of the burbot with most other fish was and still is not clearly understood. The burbot also served as prey for the lamprey and may have been exceptionally vulnerable because of its soft skin.[12]

1960 - Present

The present commercial fishery of Lake Ontario is generally depressed due to limited harvests and lack of demand for its products. Some successful commercial fisheries are operating in Chaumont Bay and Bay of Quinte and these make up a very large portion of the annual catch for Lake Ontario (Table 7).

The 1971 combined catch value for New York and Ontario was $516,000, with Ontario accounting for nearly all of the income. The Ontario commercial fishery of 1969 employed 277 men. Assuming the same number of men were employed in harvesting the $437,000 catch in 1971, productivity per man was $1578. For comparison with the value of other fisheries in Canada, the 1960 Great Lakes fishery catch in Ontario was valued at $2089/man, all Ontario inland fisheries were valued at $1462/man, and both Canadian coastal fisheries were valued at $1328/man.[13] For further comparison, the average production value on Ontario workers in agriculture in 1960 was $3017/man, and $8000/man in forestry and mining.

The only significant commercial fisheries remaining in Lake Ontario are in the shoal areas in the eastern corner, but some small operators will continue to fish in other areas until economic realities compel them to quit. The present catch statistics show the cold-water coregonids and lake trout are continuing to be irresponsible reduced, but relatively stable warmwater fish catches in the eastern bays provide an important local industry.

The most potentially important component of the warmwater commercial fishery of Lake Ontario is a recent oceanic invader, the white perch. The annual catch of white perch (actually a temperate bass) has nearly caught

Table 7

Commercial Catch in Lake Ontario - 1971

	ONTARIO		NEW YORK STATE			
	All Waters		Chaumont Bay		Open Waters	
	lb. x 10^3	Value	lb. x 10^3	Value	lb. x 10^3	Value
		in thous.		in thous.		in thous.
Yellow Perch	758	$ 153	13	$ 3	5	$ 1
White Perch	634	64			36	9
Bull Head	593	39	95	29		
Carp	429	51	22	1		
Smelt	187	30				
Eels	106	41	50	13		
Sunfish	141	16	9	2		
Rock Bass	53	9	8	0.7	3	0.2
Catfish	25	10	1	0.4		
Lake Herring	20	4				
Northern Pike	15	2				
ke Whitefish	15	8				
Walleye	7	3				
Sucker	7	0.4	6	0.4		
White Bass	3	0.9	75	19	2	0.4
Bowfin			1	0.1		
Burbot						
Cisco						
Crappie			4	0.6		
Drum						
Others	40	6.0				
TOTALS	3,033	$437,300	284	$ 68,600	46	$ 10,600

Total Catch 1971 - 3,363,000 lb.
Value - $516,500

From GLFC(1972)

Note: Catches under 1000 lb. and their values are not included. Original figures are rounded, therefore totals may vary.

up with the annual catch of yellow perch, which accounted for 23% of the total 1971 catch (Table 7). The greatest increases in white perch are found in shallow waters rather than in the open lake (Figure 4). The white perch probably entered Lake Ontario through the New York Barge Canal and the Oswego River about 1950.[14] By springtime 1960, they were more abundant in samples in the Bay of Quinte than any other fish but the alewife. Many areas in the Bay of Quinte previously occupied by smelt, pike, largemouth bass and bowfin are now dominated by white perch. The relationship between these fish and the invader is unclear.

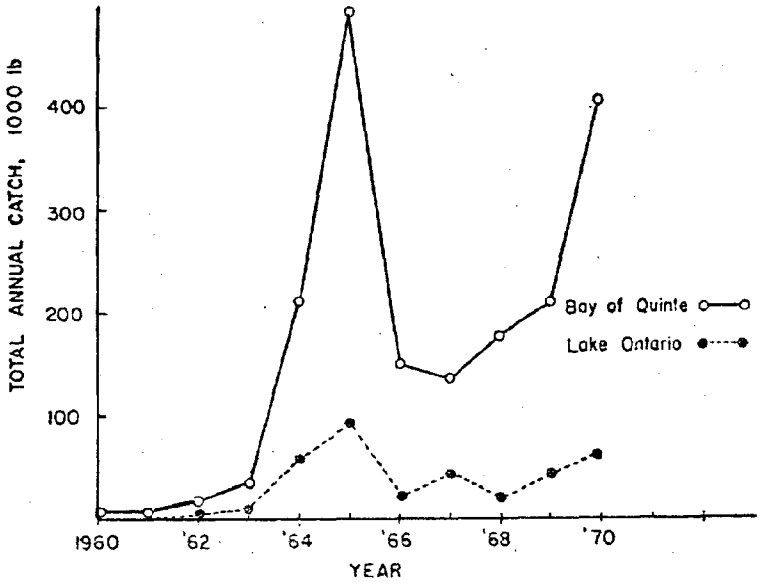
Other species important in the 1971 catch are yellow perch (the most abundant and comprising about 30% of the total catch value - Table 7), bullhead, carp, and smelt. Yellow perch stocks have expanded greatly in the open waters of Lake Ontario (Figure 5). The value of the catch is greatest for yellow perch, white perch, bullheads and eels, respectively. There are some interesting differences in price values of white perch between the United States and Canada. White perch in the U.S. catch are worth three times as much as those in the Ontario catch (Table 5); even though 85-90% of the Ontario catch is exported to the United States.

Marketing

New York catches from Chaumont Bay (primarily bullheads) are sold locally and shipped to Fulton Market in New York City. Other markets are Buffalo and Rochester. Some species such as white perch are filleted, deep-fat fried and sold locally in Oswego. Most Ontario commercial

Figure 4

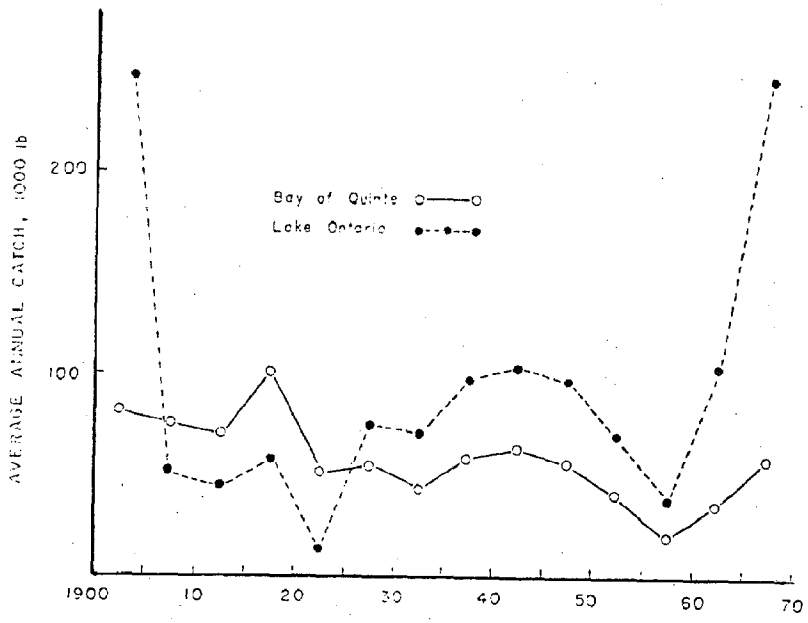
Trends in Canadian Commercial White Perch Catch
(Lake Ontario Data are Exclusive of Bay of Quinte Values)



Source: Christie (ref. 1)

Figure 5

Trends in Canadian Commercial Yellow Perch Catch
(Lake Ontario Data are Exclusive of Bay of Quinte Values)



Source: Christie (ref 1.)

fishermen sell their warmwater fish catch to four fish canneries in the Bay of Quinte area. Eels are caught in eel pots and traps in the bays in the northeast shallow portion of Lake Ontario and near tributaries in other parts of the lake. Most eels are marketed in Montreal, but mercury levels in the eels has become a matter of concern and has depressed the eel market. Smelt and alewifes are processed and sold for pet food. Smelt processing has been mechanized and becomes worth the expense of sorting the seine hauls when the market gets above $0.10 per pound (assuming no transporting or freezing loss).[15]

Licensing and Catch Regulations

Licensing of commercial fisherman is handled by the individual governments, but the Great Lakes Fishery Commission receives reports and mediates catch regulations. Ontario commercial licenses are sold openly at times, and are also passed on as family rite. In the last 20 years, the number of Ontario fishermen on Lake Ontario has dropped from 635 (1950) to 277 (1970). New York commercial licenses are sold openly on a yearly basis. In the last 20 years, the number of licenses has dropped from 45 (1950) to 18 (1970).

This potentially enormous fishery resource has been "regulated" by governments and biologists who have not had adequate information and funds for properly managing the fishery. Markets, technology, and the persistence of the fishing industry have been the major forces behind the selective fishing pressure and over-exploitation. Binational co-operation is essential for meaningful information gathering and decision-making for the fishery.

There are few working models of international management of similar large fisheries. The coregonid-salmonid fishery of Lake Constance between Austria, West Germany, and Switzerland has experienced many of the problems facing Lake Ontario; and a sound, but not completely effective, international organization has been operating since 1894.[16]

Great Lakes Fishery Commission

The first effective move toward controlling fishing in Lake Ontario through international agreements was initiated by New York and Ontario in the late 1940's. The Lake Ontario Management Commission was an informal group cooperating until 1955 when the Great Lakes Fishery Commission (GLFC) was officially established. A treaty in 1946 set the specifications for the organization, but legislators resisted granting regulatory powers to the Commission until 1955.[17] The Commission consists of three representatives from each country and has been delegated powers to set regulations on season, gear, catch quotas, and to conduct research, carry out any needed stocking programs, compile data, and to develop a comprehensive plan for effective management of the fishery resource of the Great Lakes.

The task of "managing" the fisheries of Lake Ontario at such a late stage of deterioration was indeed formidable. The fishery catch had never been managed nor had basic fish population research ever approached an adequate understanding of the size of harvest compatible with a maximum sustained yield.

With the lake trout at near-extinction, the first task was to rid the waters of the destructive sea lamprey. The lamprey control program has been the principal accomplishment of the GLFC. Until recently, most research was uncoordinated and often concentrated on isolated segments of the lamprey problem. Although some significant progress has been made in controlling the lamprey, the GLFC has been criticized because it has not developed a comprehensive management plan for the Great Lakes fisheries. Lamprey control efforts were first directed toward the upper Great Lakes because of the immediacy of the problem - the collapse of the 1950's. The fishery of Lake Ontario had been upset for nearly a generation and control efforts and funds for lamprey control efforts on that lake were postponed more than 10 years. Control crews treated 22 lamprey spawning streams in October 1971 in Ontario and in May 1972 crews treated 19 streams and 38 tributaries in New York.[18] Low-head dams which allow valuable fish to pass over, but prevent free swimming lampreys from entering the spawning grounds are planned as permanent control measures for many of the important lamprey tributaries. Control measures will only depress the lamprey numbers and probably will never eliminate them. The intensity of this control effort will, therefore, be dependent on the economic decision concerning the cost of additional units of treatment and the resultant increase in man's share of the fishery.

Stocking programs are discussed at GLFC meetings, but there have been no big breakthroughs toward cooperation in a planned program aiming for a restructured ecosystem. There are still too many unknowns about the lake, unknowns about the success of the fishes introduced, and there

are too many vested interests preventing biologists from making one strong thrust with a few selected species. A more promising program under the joint direction of the GLFC is the International Field Year Great Lakes (IFYGL). The 1971 - 1973 programs were directed toward developing baseline information on the physical and biological limnology of Lake Ontario. The data generated are now being interpreted and reports are expected to be made available in 1974 and thereafter.

Stocking

Stocking programs were attempted in Lake Ontario as early as 1878 with the rainbow trout. Efforts with other salmonids are now being attempted on a larger scale. Recent introductions have shown little coordination among managing agencies.[19] There are many complicating factors in these stocking programs because the philosophy or basic design of the future fishery is not well-defined. Problems arise from (1) public pressure for exotic fish which have done well elsewhere, (2) shortage of funds, (3) inadequate information on species requirements, and (4) inadequate information on the lake's dynamics. Without this information, much of which may be available in a few years, the stocking program is still forging ahead in the traditional "trial and error" fashion.

It seems that most decision-makers agree that the Lake Ontario fishery should be restructured (through stocking and control) for the most efficient and profitable fishery production. With respect to stocking, the lake trout has proven to be the major vector in transporting materials and energy through the lake.[20] Once lamprey populations are reduced,

a stocking of fish with characteristics similar to the lake trout would seem to be a logical choice. The fishermen are accustomed to harvesting lake trout, and lake trout live compatibly with most other fishes already present. Problems with lake trout are (1) slow maturity (increasing the vulnerability to lamprey predation) and (2) susceptibility of the eggs to predation by the slimy sculpin.

The splake, a cross between brook trout (1/5) and lake trout (4/5) has been developed by Ontario. The fish is faster maturing than the lake trout and more active while occupying the depths. Even though some aquarium studies indicate lamprey preference for splake, this greater activity may decrease their susceptibility to lampreys in open waters. Another possibility is the "Finger Lakes strain" lake trout which is reported less vulnerable to lamprey attack. Pearch reports gill net returns of "Finger Lake strain" lake trout stocked in Lake Ontario in the early 1960's indicate they can tolerate the conditions and should be the focus of a stocking program. Christie and many other biologists are in favor of focusing on splake. If splake are to maintain the characteristics of the hybrid in a natural population, then lake trout must not be available for crossbreeding.

The 1972 stocking programs are heavily weighted toward coho (silver) salmon, chinook (king) salmon, and kokanee (landlocked sockeye) salmon. New York is severely limited by funds, but the stocking program has expanded from the single species effort (coho) of 1968-1971 to coho and chinook in 1972. Future plans include steel-head (rainbow) trout, landlocked Atlantic salmon, and splake.

The projected stocking program described by the director of the laboratory responsible for formulating the management plan for Lake Ontario, Pearce at Cape Vincent, New York, does not rely on natural reproduction of the stocked fish, but rather relies on annual plantings. Ontario's stocking programs are concentration on coho, chinook, kokanee, rainbow and splake. More optimism was expressed for reproduction of the introduced fishes by Ontario biologists.[21]

The development of a salmonid fishery may primarily serve anglers rather than commercial fishermen, as the demand for sport fishing is rapidly outgrowing the supply of accessible, good fishing areas. Even though improved public information and education, more access to public waters, and more intensive management could solve a good portion of this inland resource shortage, the enormous potential of Lake Ontario and adjoining streams could evolve into a multi-million dollar fishery. The combination of commercial and sport fishing can be managed to maximize the harvest, but severe conflicts could result if public education and sensible regulations are not promoted. Presently, the only interaction between commercial fishermen and anglers is in the Bay of Quinte-Chaumont Bay-Thousand Islands region of Lake Ontario. Conflicts have developed between smallmouth bass anglers and yellow perch and white perch gill net operations. Christie (1965) ranks walleye as the most disputed-over fish in all the Great Lakes, and, expectedly, the walleye stocks in Lake Ontario are becoming exceedingly low. It is advantageous to couple sport and commercial fishing because commercial operations are attracted to maximum biomass rather than size and they can work areas not accessible to anglers.

Sport Fishing in Lake Ontario

The sport fishery of Lake Ontario is presently of minor importance except for the northeast corner of the lake. Stream-run salmonids (mostly rainbow trout) are important in many tributaries, but few fish are caught in the waters of the lake. The smelt fishermen number more than one thousand in Ontario and probably more in New York. The warmwater fishery in the shoal area from Brighton to Stony Point is dominated by yellow perch, rock bass, northern pike, and smallmouth bass. Smallmouth bass and pike are most important in Canadian waters; and smallmouth bass is most important in U.S. waters. The fishery extending up the St. Lawrence River has smallmouth bass as by far the most important species. A 1971 census for northeastern regions of Ontario waters shows about equal importance (number of rod hours spent) for pike and smallmouth bass with increasing catches of yellow perch. Jolliff and LeTendre (1966) report the sport fishery of the U. S. eastern Lake Ontario-St. Lawrence River area was most dependent on smallmouth bass.[22] Fishermen preferred smallmouth bass, northern pike, and yellow perch, respectively; but the catch was greatest in yellow perch and rock bass, respectively. Three out of four fishermen in the Thousand Island region were New York State residents. A comprehensive plan for increasing the warmwater fishery and developing a salmonid fishery for this region is described by Pearce in the Great Lakes Basin Framework Study (GLBFS), Appendix 8, (1972).

The plans for developing a salmonid fishery in Lake Ontario are directed toward the sport harvest. To date, the experimental stocking has not developed a viable fishery. With lamprey control programs underway,

and extensive stocking programs being initiated, the future sport fishery of Lake Ontario could prosper and develop into an important recreation resource.

Sport Fishery of the Lake Ontario Basin

Angling in the Lake Ontario drainage basin provides some of the finest freshwater fishing in the northeast. The lakes region of northern Ontario offers an additional fishery to the rugged sportsman and is within a day's travel time for most people in the Basin. Warmwater as well as cold-water fishing are found throughout the basin; with the better areas being located in the Finger Lakes, Adirondacks, Trent-Severn, and Thousand Islands regions. Statistics on fishing licenses issued within the Basin are not available, but the 1969 total for the province (51% of the 1969 Ontario population lived in the Basin) was 610,668 resident licenses, and 813,718 1970 resident licenses in New York (11% of the 1960 New York population lived in the Basin).

The sport fishery in the U.S. portion of the Basin has been thoroughly assessed by the GLBC.[23] The counties in the eastern section of the Basin contain the greatest number of cold and warmwater streams as well as the greatest acreage of ponds. Brook, brown and rainbow trout are valuable fish in that region. Many streams have strong potential for salmonid spawning runs if the Lake Ontario anadromous fish program is successful. In the central portion of the drainage basin (Oswego, Fulton, Wayne Counties plus the Finger Lakes region), rainbow and lake trout provide an extensive fishery in the Finger Lakes and warmwater fisheries yield smallmouth bass, walleye, yellow perch and northern pike. The western portion of the drainage basin (Genesee River basin) contains the least number of ponds,

but offers a wide variety of warm and cold-water fish habitats. The warmwater fishery is most important, with yellow perch, northern pike, walleye, and smallmouth bass supplying the mainstay of the catch.

Sport fishing in Ontario is administered by the Department of Lands and Forests, which carries out extensive stocking programs for warm and cold-water fishing. Ten pond-fishing areas near urban centers are operated by the provincial government on an intensive basis to provide the public with trout fishing. Many conservation authority parks provide pond and brook fishing, and the Federal Park is in the heart of the Thousand Islands fishing area. A 1971 creel census at lakes in the Prince Edwards County area showed walleye, northern pike, and smallmouth bass to be most important.

Future of the Fishery

The Great Lakes Fishery Commission met for the first time in 1956 having been assigned the task of developing and coordinating a comprehensive fisheries management program for the lakes. Among the many problems confronting the Commission were (1) a collapsed fishery; (2) conflicts of interest among the many governments; (3) a number of separate agencies funding and regulating parts of the fishery; and (4) lack of knowledge about the biology of the lake ecosystems. Much progress has been made since then but the lakes, particularly Lake Ontario, have not been managed on the basis of a mutually agreed upon comprehensive plan for maximizing a harvest. In some respects, the GLFC has failed to address itself to the basic purposes of resource management - serving the needs of the users and refining the tools available to manipulate the fishery resource.

In recent years, research has been focused more on these management tools, but the many years of uncoordinated research on segments of the marine ecosystem have made little if any direct contribution to fishery management needs. This situation is changing, however. There is a constantly increasing recognition among scientists and administrators that the complex forces regulating the strengths of fish populations will be unraveled only through coordinated, interdisciplinary research efforts.

Problems which are not receiving enough attention from the GLFC include a lack of agreement between decision-makers on specific management goals such as the philosophy of stocking, public information, and coordination with other joint bodies, e.g., the International Joint Commission. The public must be better informed on the enormous potential of the Great Lakes as a recreation and life-support resource. There must be stronger support for the GLFC if it is to gain more authority. Much of the funding is still handled at a regional rather than at the international level. Financial incentives properly applied through the GLFC are needed to counterbalance the parochial attitudes found in the regional agencies and publics. The commercial fishermen now operating in Lake Ontario should be studied as a group and they should be encouraged to adopt more cooperative working relationships. A strong working relationship should be developed between the GLFC and the commercial fisherman now when resource users are few. The fisherman community will probably resist organization, but some sort of communication channels must be established if the common goals of a free operating market, effective technical assistance, and ease in information exchange are to be attained.

The inland sport fishery is closely tied to the lake fishery and if the salmonid program is successful, it will become increasingly important that close cooperation is maintained among the governments concerned. Presently, there is limited information exchange among agencies dealing with sport fishing outside the immediate waters of Lake Ontario. When the salmonid program begins to gain momentum, more coordination will be necessary. Presently, closer communication between these agencies would be instrumental in reducing the stifling provincial approach to management and would help these decision-makers better understand the differences in interest and operations which do exist between regions.

Recapitulation

Lake Ontario's future as a useful fishery is in the hands of the GLFC. This organization has had many problems in attempting to manage the fishery resource. Despite the lack of coordination among other agencies influencing water quality and other international functions, the GLFC has made progress in certain areas of the fishery problem, such as lamprey control, central data collecting and filling in some of the gaps in general biological information. The most obvious inadequacy is the lack of support and authority. This is partially due to a weak publicity program and a lack of responsiveness by planners to the desires of the general public. These communication problems have resulted in (1) a stocking program being uncontrollably split in many directions; (2) conflicts between decision-makers; and (3) prolonged depression of a potentially enormous fishery resource. Closer binational cooperation could lead to more useful research and mutual respect among biologists, policymakers, and all resource users.

REFERENCES AND FOOTNOTES - CHAPTER VIII

[1]W. J. Christie, Fish Species Succession in Lake Ontario, in J. Fish Res. Bd. Canada, July 1972.

[2]W. A. Pearce, pers. comms., New York Department of Environmental Conservation, Cape Vincent, New York, 1972.

[3]Christie, op. cit., note 1.

[4]W. J. Christie, Fish Species Succession in Lake Ontario, SCOL reports, Great Lakes Fisheries Laboratory, Ann Arbor, Michigan, 1971 ms.

[5]Ibid.

[6]J. G. Lark, 1972 ms, An Early Record of Sea Lamprey from Lake Ontario, cited in Christie, op. cit., note 1.

[7]S. H. Smith, Ecological Succession in Oligotrophic Fish Communities of the Laurentian Great Lakes and Prospects for the Next Century, SCOL report, Great Lakes Fishery Laboratory, Ann Arbor, Michigan, 1971.

[8]Christie, op. cit., note 4.

[9]Christie, op. cit., note 1.

[10]Christie, pers. comm., 1972.

[11]W. J. Christie and H. A. Regier, Temperature as a Major Factor Influencing Reproductive Success of Fish-Two Examples, 1970, cited in Christie, op. cit., note 1.

[12]Christie, op. cit., note 4.

[13]H. C. Frick, Economic Aspects of the Great Lakes Fisheries of Ontario, J. Fish, Res. Board Canada Bulletin 149, 1965.

[14]Christie, op. cit., note 1.

[15]Frick, op. cit., note 13.

[16]W. Numann, Der Bodensee-Lake Constance, SCOL papers in J. Fish, Res. Board Canada, summer 1972.

[17]D. C. Piper, The International Law of the Great Lakes, A Study of Canadian U.S. Cooperation, Duke University Commonwealth Studies Center, 1967.

[18]P. Neth, Report to the Great Lakes Fishery Commission, Annual Meeting, 1972.

[19]W. J. Christie, The Potential Exotic Fishes in the Great Lakes in A Symposium on Introductions of Exotic Species, Ontario Department of Lands and Forests Research Report 82, 1968.

[20]Christie, op. cit., note 1.

[21]Christie, pers. comm., 1972.

[22]T. M. Jolliff, and G. C. LeTendre, The Eastern Lake Ontario-St. Lawrence River, New York Creel Census of 1966, unpublished report, New York D.E.C., Cape Vincent, New York, 1966.

[23]Great Lakes Basin Framework Study, Appendix 8, Fish, 1972.

CHAPTER IX

OUTDOOR RECREATION*

Introduction

Outdoor recreation in itself is not a major resource management concern of the proposed bilateral organization; however, it does affect and is in turn affected by decisions made relating to the primary problem areas such as water quality, lake levels, shoreline development and others. While no special office would be set up within the new organization to focus on matters relating to outdoor recreation, the policy-making elements of the organization would need to consider it and thus there would be an implied research requirement for it. Moreover, outdoor recreation will become in time a more and more important facet of resource management. This chapter is concerned with the present and anticipated future problems of outdoor recreation. Again the frame of reference is the Lake Ontario Basin.

General Situation

As our societies continue to grow and urbanize, outdoor recreation assumes increasing importance. With more leisure time, travel opportunities, and interest in outdoor activities, the demands on our recreation resources have multiplied. Recreational travel became important during the 1930's when road building programs opened many recreational areas for public access. With increasing family mobility over the past decades, pressures of overuse have made long range planning essential for preserving, managing and developing natural areas.

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*This chapter is based on a paper by Douglas M. Carlson, Management of the Biological Resources of the Lake Ontario Basin, Cornell University, 1972.

Dworsky, et al., in an unpublished study in 1971 found that the 28,500 acres of recreation lands in New York represent only 65% of the public land needed to meet the existing recreational demand. Ontario is experiencing similar shortages of available recreation. Public lands are in abundance in the Ontario portion of the basin, but the areas are not easily accessible to the urban dwellers concentrated along the western shoreline and not adequately developed for intense use.

The 1971 Great Lakes Basin Framework Study[1] lists the recreation problems as "competing land use, high land costs, complex ownership problems, public opposition toward legal restraints attached to reservoirs and associated recreation facilities, inadequate funds and competition for the tax dollar, highway congestion and overuse of certain parks, environmental disturbances by off-the-highway vehicles, physical and legal barriers to deny access to existing and potential recreation lands, multiple activity incompatibility, inadequate area supervision, inadequate stress on environmental education, and inadequate government-citizen involvement in the planning and decision-making process." Access to recreation areas is the cause of most recreational problems. Judicial precedents to solving problems where private interests were preventing access to public waters are discussed by Dewsnup (1971).[2]

In-depth studies are available on recreational plans and land capability for many individual watersheds and for regional governments. The U.S. Army Corps of Engineers, U.S. Water Quality Office of the Environmental Protection Agency, U.S. Bureau of Outdoor Recreation (B.O.R.) and conservation authorities of Ontario are responsible for much of the background data and local planning for future water and land recreation needs. Ontario recreation activities were mentioned one-sixth of the time in a 1959-60 U.S. national survey on the use of leisure time (B.O.R., 1967). A 1962 survey[3] indicated one-fifth of all free time in the Great Lakes Basin was devoted to outdoor recreation activities.

In a 1963 study, Clausen estimated that 7 percent of leisure time of U.S. citizens is spent in outdoor recreation.[4] The historical tendency for the work week to shorten in both Canada and the United States will also affect the demand for outdoor recreation.

In a 1960 study of the U.S. portion of the Lake Ontario Basin, the U.S. Bureau of Outdoor Recreation reported that summer activities accounted for 72 percent of the annual recreation demand and that water-based recreation activities accounted for 43 percent of the annual demand.[5] The BOR study also estimated that of the annual 2.25 million vacationists, the average person stayed 6.4 days and the average party size was 3.7 people. The other segment of the recreation market was the summer resident living in cabins or cottages adjacent to a lake or river. The greatest concentration of these summer homes was in Jefferson County, New York, while another significant concentration was in the Finger Lakes region.

The administrative agencies of outdoor recreation around Lake Ontario are so fragmented that little coordination in recreation planning has been attempted except for initial efforts in the last few years. Each governing commission provides a somewhat different type of service, but these types, or functions, are not specifically defined. Presently, there are eight public agencies, along with the private sector, among which there is not adequate coordination. A sound planning base must start with a total and coordinated assessment of the needs of the recreation public. The recreation resource agencies in the two countries should cooperate more, at least on an information exchange basis, so that there is an amicable working relationship among those agencies. Perhaps there could be developed a binational assistance program to develop regional recreation facilities

and provide joint incentives to encourage private developers to assist in meeting the recreation demand.

Supply and Demand

Developed outdoor recreation areas along Lake Ontario are concentrated on the eastern shoreline, and other sites throughout the Basin are concentrated in the Finger Lakes region, eastern Adirondacks region, and the northwestern metropolitan area. Ontario has five different commissions overseeing 88 recreation areas: National Parks (1); Niagara Parks Commission (7); St. Lawrence Park Commission (17); Provincial Parks (9); and Conservation Authorities (53). New York's 92 public recreation areas are operated by Federal (2), state (54), and local (36) agencies. Ontario has nearly an equal number of public parks as New York, but Ontario's public lands occupy only 30% of the acreage of New York parks and 1964-65 visitation was only 33% that of New York (Ontario has 51% of the provincial population in the Lake Ontario Basin). This indicates fewer recreationists are depending on public areas in the northern portion of the lake basin, and there is probably more out-migration to the north and south, whereas in New York there is probably more in-migration from more southern, eastern and northern regions.

A 1960 user survey for New York shows sightseeing, swimming, picnicking, and fishing, respectively, to be the most preferred of 12 water-enhanced outdoor activities (Table 8). Camping was participated in by only 10% of the interviewed vacationists. Demand for these outdoor activities in the New York portion of the basin are reported as activity occasion units. These activity occasions are converted to recreation

Table 8

Demand for Selected Water-Oriented Outdoor Recreational Activities
Lake Ontario Basin, 1960
(Vacation Sector)

Activity	Percent who engaged in outdoor activities on vacation trips	Column 2 x 14,404,269* activity occasions (1,000's)
(a) Sightseeing	53	7,634
(b) Swimming	38	5,474
(c) Fishing	27	3,889
(d) Picnicking	29	4,177
(e) Boating & Canoeing	19	2,737
(f) Hiking	14	2,017
(g) Camping	10	1,440
(h) Hunting	4	576
(i) Nature Walks	6	864
(j) Horseback riding	3	432
(k) Skiing & Winter Sports	1	144
(l) Took trip but did not engage in outdoor activities	22	3,169
Totals	226**	28,952***

* See result in Step 7
** Totals to more than 100 because vacationists participate in more than one activity per day
*** Total does not include activities (j) and (l).

Note: This analysis assumes that those enjoying their vacations while in the basin participated in approximately two activities on the average per day.

Source: U.S. Department of the Interior
Bureau of Outdoor Recreation (BOR)
(ref. 5)

days by allowing 2.5 activities/average visit (recreation day) to a recreation area. Even though the basic assumptions for these generalizations are questionable, figures are arrived at and can be used comparatively with other estimates to plan and predict. The 1960 annual demand was 35,087,200 recreation days for the New York portion of the basin.[6] The GLBFS (21) uses a different list of activities and different assumptions to arrive at a weighted unit value for each type of recreation day. Land requirements are then determined for meeting the future demand using these weighted values. The preference of activities in this 1970 study, based on past-use records, shows outdoor games, swimming, sightseeing and picnicking, respectively, as being in greatest demand for 25 outdoor activities.[7]

The water resource is very important in meeting these recreation demands. The natural diversity and abundance of wild animals and plants near bodies of water make any outdoor experience more pleasurable and memorable. For these reasons, along with a host of others concerning land acquisition, many recreation areas are located along waterways. Of the 358 publicly-owned recreation areas in the U.S. portion of the Basin, 82 percent of the areas are water-dependent or are located by water.[8] Eighty-seven percent of the private campgrounds in the same region are located along water bodies. Of the 54 state parks, 41 are located within 10 miles of Lake Ontario.[9]

Outdoor activities such as outdoor sports and picnicking are provided for in most general recreation areas, so the following discussion will pertain to the activities requiring more intense planning efforts such as swimming, boating, camping, hiking, winter sports, and sightseeing.

Swimming

Swimming is very dependent on the weather in the northern climates, but this sport is by far the most important water-associated activity. Results of a 1965 survey showed 75 percent of the campers in the Thousand Islands State Parks (New York) would not stay at these parks if swimming facilities were not provided. Many types of areas throughout the Basin are presently available to swimmers, but many public areas are becoming overcrowded. Public access to lakefronts is often restrictive because water pollution has fouled many beaches. Potential beaches along Lake Ontario are limited because of the local topography. There are about 35 miles of beaches on the New York side and more in Ontario. Unfortunately, the Ontario population is concentrated in the western end of the basin and most beach areas are located in the eastern part, where 72% of the total usable lake shoreline occurs. Recreational waterfront developments near metropolitan areas are getting greater attention. The water quality in these areas is often prohibitive to swimming, but many types of surface activities are once again made possible by ensuring public access and providing attractive parks. Such developments are completed, or under development in Toronto, Hamilton, Port Credit, and Mississauga by the respective regional conservation authorities.

Boating

Recreational boating opportunities in the Lake Ontario Basin are considered superior to those in any of the other Great Lakes.[10] Boating is available to the vacationer at 56 percent of the N.Y. publicly-owned recreation areas located near water. Launching sites are found at numerous

locations throughout the Basin in New York and Ontario. The New York Barge Canal provides 524 miles of navigable water connecting the Niagara River and Lake Ontario with the Finger Lakes, Oneida Lake, the Mohawk River and Atlantic Ocean. This route has opened up oceanic yachting opportunities to much of central New York. The St. Lawrence River also offers excellent boating and yachting areas. Additional Ontario waters developed for boating include the Trent-Severn Recreational area east of Lake Simcoe and the Bay of Quinte in Lake Ontario. The extensive planning going into the Trent-Severn recreation corridor will offer a wide variety of recreational opportunities to the Toronto region (Rideau-Trent-Severn Study Commission, 1971).

Camping

Camping interest has spread rapidly in the last few decades, and private developers are starting to meet the demand with which public parks have failed to keep pace. Public camping areas are found in less than 5 percent of the Ontario 54 Conservation Authority areas (a total of 655 campsites), and in only five of the nine Ontario provincial parks (a total of more than 1,512 campsites). The Niagara Parks Commission is generally restricted to historic and scenic areas with limited picnic facilities for tourists. The Thousand Islands area of the St. Lawrence River is very popular with campers. The fourteen St. Lawrence Commission parks contain 2,350 camping and trailer sites; and the National Park, only 0.4 sq. mile in area, has more than 100 campsites. The origin of 1963 campers in Ontario provincial parks in the Basin varied from about 1/8 to 1/3 U.S. citizens and 1/3 to 1/2 Toronto metropolitan residents.

In parks administered by the St. Lawrence Parks Commission, 50% of the 1971 campers were Ontario residents, 36% from Quebec and about 13% from the United States.[11] Camping facilities in the New York portion of the Basin are found in 62 percent of the state parks and 22 percent of the local parks have camping facilities. These data show that Ontario provincial and, in particular, Conservation Authority Park agencies in the Basin are lagging somewhat in meeting camping demands as compared with the St. Lawrence and New York public park agencies.

Hiking

Nature paths and hiking trails are getting increasingly greater use and many local-concern groups are contributing greatly to trail maintenance. Only one provincial park has a nature path, but 55 percent of the Conservation Authority Parks have paths. In New York, there are nine state parks with nature walks and many more in county recreation areas. Hiking enthusiasts have access to many exciting trails in the Finger Lakes Region, Adirondack-Appalachian region, and the 450 miles of Bruce Trail along the Niagara escarpment which was completed in 1967.

Winter Sports

Of the winter sports, skating and sledding are in greatest demand and require the least planning. Skiing areas are within a few hours driving of all spots in the Lake Ontario Basin. New York lists a total of 47 slopes, 59 trails, 28 lifts and 22 tows at 17 different locations and Ontario has skiing at 26 different locations.

In a 1965 survey of skiers' preference by the New York State Department of Commerce, the "typical" skier prefers chair lifts and moderate

slopes, has his own equipment, stays overnight half the time and considers social activities important in selecting a ski center.[12]

Sightseeing

Travel on scenic highways is the preferred recreation of many vacationists. With the development of a rapid expressway system, much of the commercial and business traffic has been transferred away from the older roadways. These older routes often blend excellently with the landscape and pass through areas with real local flavor and scenic overlooks. Many of these routes could be easily reconditioned and updated to handle tourist traffic. The designated scenic parkways include the Lake Ontario State Parkway and Robert Moses State Parkway in New York State, and the Niagara Parkway and Long Sault Parkway in Ontario.

Planning

Before planners begin estimating future demands, extensive surveys must be conducted to determine the characteristics of the recreationists and which activities are preferred.

New York. Comprehensive plans for New York State and the U.S. Great Lakes Basin have not had available adequate preliminary information on recreationists before projecting recreation demand. Efforts in assessing recreationists' characteristics and preferences are usually done in a piecemeal fashion and little regional coordination has been attempted. The 1967 BOR report presents many studies on individual parks and includes a complete listing of recreation facilities in the U.S. portion of the Basin. However, this study is becoming out-dated and progression to the next stage - specification of areas to be developed and final planning - was

neglected. The GLBFS (21) uses different demand estimates and proposes specific developments to meet the predicted requirements. These predictions, like the BOR estimates, are based on the rather doubtful assumption of continued growth at present rates and makes projections for resource requirements up to 2020 for 5 study areas in the U.S. portion of the Basin. A more attractive prediction base is described by Kalter and Gosse (1970) in a mathematical model for 15-year demand projections.[13] The data based on 1960 and 1965 surveys on five selected activities in eight regions in New York State are used to estimate demand in 1985.

Ontario. Commissions providing Ontario's public with outdoor recreation are widely dispersed and, except for the last few years, there has been very little planning coordination among them. In most recent years, some agencies have extended their efforts to other areas such as waterfront plans, fishery management and forest management; and more agency cooperation may be desirable if inefficient duplication or ill-advised development is to be avoided.

Progressive planning in the last five years has resulted in: more comprehensive assessment of public and recreationist preferences; assessment of present recreation facilities; research on methodology and techniques such as origin models, destination models, and patterns of participation; and distribution of information. The Canada Outdoor Recreation Demand (CORD) study is nationwide and is computerized in central data banks. The results of this study are not available and the CORD concept has been further developed. Those planners involved in the study are satisfied with the results, as indicated in the following statement:

> "The value of the CORD data in planning for outdoor recreation projects is justification for continuing recreation research studies by all levels of government. According to United States experts, the CORD data offer the solution to 'demand' problems that are extremely important and yet have not been solved by incomparably higher research dollar expenditures for research in outdoor recreation in the United States."[14]

Directions of Cooperation

The areas in which binational coordination and cooperation might prove useful include:

1. collection of user data on a common set of outdoor recreation activities;
2. agreement on definition of terms, e.g., activity occasions, to enhance comparability of data;
3. promotion of a sense of commonality of interests among agencies and professionals concerned with recreation problems and issues;
4. consideration of joint development of one or more recreation areas; and
5. minimization of overdevelopment of certain recreational sources at the expense of other sources.

There is no suggestion that there be established any kind of joint body to control outdoor recreation. Outdoor recreation is essentially a local and state/provincial responsibility. It should remain there. Nevertheless, some provision must be made by which government agencies as well as nongovernmental agencies and private interests can improve planning and can make their voices heard in the new joint organization.

Outdoor recreation can be an important issue at the local level. If handled improperly by the new organization, it could detract from the positive effect of some of the organization's successes. On the other hand, if outdoor recreation is accorded the consideration it merits, it can only enhance both the competence as well as the image of the new organization.

REFERENCES AND FOOTNOTES - CHAPTER IX

[1]Great Lakes Basin Framework Study (GLBFS), Outdoor Recreation, Appendix 21, August 1971.

[2]Richard L. Dewsnup, Public Access Rights in Waters and Shorelands, National Water Commission, National Technical Information Service, Springfield, Virginia, 1971.

[3]GLBFS, op. cit., note 1.

[4]Marion Clawson, Land and Water for Recreation, Rand McNally and Company, Chicago, Illinois, 1963.

[5]U.S. Department of the Interior, Bureau of Outdoor Recreation (BOR), Water Oriented Outdoor Recreation in the Lake Ontario Basin, 1967.

[6]Ibid.

[7]GLBFS, op. cit., note 1.

[8]BOR, op. cit., note 5.

[9]New York State Department of Conservation, Computer Print Out of Current Private and Public Recreation Areas in New York State, Albany, New York, 1972.

[10]BOR, op. cit., note 5.

[11]G. W. Arthurs, pers. comm., Public Relations Officer, St. Lawrence Park Commission, Morrisburg, Ontario, 1972.

[12]BOR, op. cit., note 5.

[13]R. J. Kalter and L. E. Gosse, Outdoor Recreation in New York State: Projections of Demand, Economic Value and Pricing Effects for Period 1970-1985, Special Cornell Series #5, 1970.

[14]Canada Outdoor Recreation Demand (CORD) Study, Branch Policy Statement, 1970.

PART THREE

SPECIAL PROBLEM AREAS

CHAPTER X

LAND USE*

Introduction

Whereas the primary focus to this point has been the water environment of the Great Lakes Basin, this chapter concerns the land environment. Land and water resources of the Basin are inextricably linked and a plan to improve the management of the water resource must also take into account the land resource. Present land use practices and issues of the Lake Ontario Basin, which are typical of the Great Lakes Basin as a whole, are examined.

Demography

In 1968 the population of the Lake Ontario Basin was 6.1 million, of which 2.3 million resided in the United States and 3.8 million in Canada. In the United States, the population of the Buffalo urban area in 1970 was 1,334,000 while the Rochester area had 875,000. In Canada, the bulk of the population is concentrated in an urban arc called the Mississauga Conurbation which runs from Oshawa southwest to Toronto and Hamilton, thence east to Niagara Falls. Population estimates (1969) for urban Hamilton were 480,000; for urban Toronto - 2,316,000. Forecasts for 1976 project a population of metropolitan Toronto of 4.6 million.

The population is moving from the rural areas to urban areas, and in particular from the north and east to the southwest and into the Ontario Lake Basin. There are 12 counties in Ontario which have land in the Basin. In the period 1951-1961, all but three of these showed population

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*This chapter is based on a paper by James M. Wolf entitled, Land Management in the Lake Ontario Basin, 1972.

growth rates above the provincial average. The pattern was similar in the period 1961-1966. More significantly, the counties of Halton, Peel and Ontario have shown population growth rates greater than 90% above the provincial average, while York and Lincoln have shown population gains in the range of 30-50% above the average. These counties, Lincoln excepted, make up the heart of the Toronto Centred Region. Thus urban areas in the Canadian part of the Lake Ontario Basin are very rapidly expanding, and doing so at the expense of the adjacent rural areas.

Most reports predict future population growth rates for the area at or above current trends. It appears likely that the rate of population growth on the Canadian side of the Basin will continue to exceed that on the U. S. side.

In Ontario, 7 percent of the population is engaged in agriculture. In the portion of the Basin in New York State only 2 percent of the population is engaged in farming. Yet about one-third of the population in the Basin, on both sides of the border, live in rural areas. Although there is a tendency for population migration from rural to urban areas, this may in part be due to an expansion of the urban centers to absorb rural lands by subdivision or other ways.

The high population concentration around the western portion of the lake, (from Oshawa to Rochester), places environmental stresses on the lake and upon the land in the area. These pressures will require action in land and water management in the years ahead.

Economic Environment

Employment trends are useful in describing the economy of a region. Buffalo and Rochester have been areas of slow growth as measured by national trends. Nevertheless, they command important positions in

manufacture of primary metals, transportation equipment and photographic equipment, among others. The Buffalo-Niagara Falls industrial complex, strategically located between centers of primary production in the mid-west, and centers producing manufactured goods in the northeast, serves as a major transportation hub.

The Toronto region is the financial, manufacturing and educational center of Canada. Manufacturing is characterized by its diversity. The city is an important shipping center and transportation link. Hamilton is also a port and the Canadian center for the primary metals industry. Overall employment growth in the area exceeds the Canadian national average.

The Province of Ontario contains 36% of the population of Canada; it accounts for over 40% of the Canadian GNP. Industrial employment has increased by one-third in the last decade. Unemployment in 1970 averaged 4.3%, or 2% below the Canadian average. The province is a leader in the Canadian economy.

Current Land Use Management Tools

The basic objective of land use planning is to facilitate the most efficient use of the land for society, and the economy as a whole. It is government action which sets the pace in land use planning. The tools which are available to the land use planner generally take two forms - incentive and restraint. Some of the current techniques available to the land use planner are briefly reviewed.

Zoning. Effective zoning dates from 1926 in the historic Village of Euclid v. Ambler Realty Co. (272 U.S. 365, 1926) decision in which the Supreme Court "strongly affirmed the power of a municipality to regulate use of private land, under defined conditions and with proper procedural safeguards." The effect of Euclid v. Ambler was an extension of the public

police power based on the common law of nuisance. Thus zoning was initially established as a legal restriction rather than as an incentive. A recent decision by the New York State Court of Appeals has widened the scope of zoning beyond that initially implied in the decision the court held that "Zoning is not just an expansion of the common law of nuisance. It seeks to achieve much more...zoning can be a vital tool for maintaining a civilized form of existence only if we employ...all the other professions concerned with urban (or land) problems.[1] (Parenthesis supplied) Zoning, which at first took the form of restrictive convenants can now be used as incentives to foster planning. For example, positive zoning techniques became requisite to providing directed growth in problems of urban renewal, traffic congestion, commercial development, rural-urban demands on the land. The effect of this approach is one of "creating community benefits rather than preventing individual harms..."[2]

Statewide Land Use Regulations. The effect of broader zoning techniques can be seen in recent legislation enacted in a few states.

Three states have enacted legislation which establish statewide land use regulations.[3] In 1961 Hawaii passed legislation which led to a classification of all land into four districts, agricultural, rural, urban and conservation. This was done to provide ordered growth in a situation where land speculation was (and still is) rampant. Under the law, land in a certain category can only be used for certain prescribed uses within that category. Vermont (1970) established an environmental board which passes on all major proposals for development in the state as well as for any development above an elevation of 2,500 feet. Maine (1970) has developed similar controls for the preservation of that state's natural environment.

Special Purpose Legislation. Some states have established land use controls over selected areas in their states. At least ten states have set controls over development in coastal areas, wetlands or shorelines. California has passed legislation affecting development in San Francisco Bay and has joined with Nevada to regulate development in the Lake Tahoe Basin. New York has created Special State Commissions under the Office of Planning Services (OPS) which are charged with reviewing all development plans for the Hudson River Valley, and the St. Lawrence-Eastern Ontario region. These commissions serve as watchdogs for development inconsistent with public uses of the land. In addition, New York has begun the process of planning for development in the Adirondack Park area by creating land use plans for this unique area. In Canada, Ontario has enacted legislation designed to protect the Niagara Escarpment against development by speculators, mining, etc. The types of development encouraged include agriculture, parks and recreation. Certain parcels along the escarpment have been earmarked for provincial purchase.

Recent legislation has been enacted in a number of states which provide for agricultural land preservation in the face of rising taxes and increased land speculation. In California, the Wilkenson Act provides a different tax basis for land set aside from development. Under the provisions of the New York State Agricultural Districts Law (1971) farmers may receive shelter from land taxes based on potential for development.

Other Land Management Techniques. While this discussion has centered upon zoning as a tool in land use planning, other public actions to control land use deserve mention. Beuscher considers slum clearance as the "most dramatic modern illustration of land use control through public acquisition"[4]. Acquisitions of land for public purposes will become increasingly important

under the concept of eminent domain as the demand for public use of the land, e.g., highways, parks, power projects, etc., becomes magnified.

Under the spending power, various grants-in-aid affect land development. For example, VA or FHA housing loans may be available only for homes meeting lot size and neighborhood standards.[5] In order to obtain matching grants for urban renewal or open space acquisitions, certain Federal criteria must be met. The Model Cities Program relied heavily on this concept of regulation through the spending power. Public policy toward provision of services such as water systems, sewage treatment, highways, will also greatly affect land use planning.

Some individuals consider taxation to be the most effective exercise of the police power. In recent years it has shifted from a revenue raising device to a regulatory power. We have already touched upon lowered land tax assessments in return for agricultural zoning. Oil and mineral tax depletion allowances have obvious implications on land use. In Mississippi, Alabama, Louisiana and Vermont, statutes permit tax exemptions as a means of attracting industrial development. Other states favor parklands and timber uses through tax exemptions.[7]

It is clear that the land planner has today a number of regulatory devices available to him. The basis for these devices has evolved from simply "harm preventing" to promoting the "greatest social good." Through the planning process, government can show that the regulations are necessary to accomplish desired social objectives. Regional planning which will rely on the regulatory devices of the land planner will also contribute to an expansion of the rules under which the planner operates.

Regional Planning

Regional planning has been defined as "the process of preparing, in advance and in a reasonably systematic fashion, recommendations as to policies and courses of action to achieve accepted objectives in the common life of urban or regional communities."[8]

The key phrase in this definition is "in advance." Planning means foresight, not simply taking action to correct mistakes. Planning should be initiated preferably when the slate is clean--when problems don't presently exist - so as to obviate potential problem areas before they develop.

Another key word in the definition is "systematic". Planning is an integrating process which draws on inputs from a variety of disciplines. Since planning can have far-reaching effects on people and resources, planning input should include, insofar as possible, a consideration of the indirect consequences of choosing particular courses of action. For example, what would be the full range of effects of transporting northern California water to the Los Angeles area? In addition to encouraging industrial and residential development, would the result be to worsen the smog problem and make commuting even more of an intractable problem? In other parts of the country, for example, in the Great Lakes Basin, we must turn the question around, how will land use planning affect the water resource?

Effective regional planning requires broad planning objectives, including livability, efficiency, amenity, flexibility, resource optimization and public participation. A plan to include the governmental functions of surveillance, mediation and control is required to meet these objectives.

Planning for a region occurs in phases. In the first phase of the planning process, goals are often defensive, i.e., they are designed to prevent further deterioration of the inner city or permanent damage to the environment. The plight of the cities is a well-known and studied phenomenon. It includes, among many other things, traffic congestion, air and water pollution, unplanned development, deterioration of housing, decline in the quality of services, and erosion of a sense of civic responsibility. Goals arise pragmatically from the real problems besetting the area.[10] Planning tools at this stage include, but are not limited to, development schedules, urban renewal, subdivision control, designation of land uses, establishment of greenbelts.

A second phase involves regulation of land use. Also considered here is actual planning and design for lands in order to limit subdivision growth and to avoid urban decay.

A third phase provides for long-range planning for the optimal use and development of the resources of an entire region. The objectives here are optimize human benefits over a specific region as well as to provide for environmental protection.

The key to the final phase is broader levels of optimal planning. Although local land use planning is a step in the right direction, it is inadequate to meet problems confronting the province, state or nation. An interregional development framework is needed to meet national goals. The challenge here is a willingness on the part of the individual regions to forego certain prerogatives for the benefit of an interregional effort to meet planning objectives.

Systematic planning in time and space thus goes beyond geographic and political boundaries for solutions. Just as southern California has looked beyond the Tehachapis for solutions to its water problems, full

management of the Great Lakes Basin require commitment and action from Canadian and U.S. interests. Let us now examine the structure of land planning in the Lake Ontario Basin with specific reference to planning in Ontario and the Toronto Centred Region.

Regional Development in Ontario

Background. In Ontario during the sixties and early seventies, three trends have called for organized planning efforts: First, there has been an increasing tendency for migration to urban centers. Accompanying this familiar migratory pattern is the equally familiar unplanned urban sprawl. The Toronto Centred Region now extends westward towards Hamilton and Waterloo, and eastward toward Oshawa. The trend is dismally familiar, choice farm land is transformed into suburbs, forests are destroyed, open pit mines and quarries scar the countryside and the air and water resources of the region are left polluted.

Structure. A regional approach to these problems in Ontario was indicated. The basis for a broad planning approach was originally established by the Federal Planning Act of 1946 which outlined procedures and regulations to be followed. In 1966, in a program known as "Design for Development, Phase I," John Robarts, Prime Minister of Ontario, stressed the belief that "regional plans and priorities should always contribute to the total environmental development and economic performance of the (whole) province" and that "regional development policies are...aspects of a broader provincial growth policy".[11]

Under the program, Design for Development, the Province of Ontario took on responsibility for developing official plans into which local governments would have maximum input. This intent was strengthened in

"Design for Development, Phase II" initiated in 1968. In this phase, guidelines were established on the provincial level. Local governments were required to develop plans in accordance with the Provincial Design for Development.

Under Design for Development, provincial regional plan determination is in three phases: (1) data gathering; (2) development of regional plans; and (3) implementation of the above through local and provincial coordination of on-site development. Phase (3) may be termed the "action" or "mediation" phase.

The Regional Development Branch of the provincial government was given responsibility for planning development and guideline determination for the province. The Branch is within the Department of the Treasury which is expectedly indicative of how close provincial planning is tied to the purse strings. The Branch acts as an administrative focal point providing coordination between the various governments and governmental agencies concerned with regional and local development.

Unlike intergovernmental endeavors in the United States, federal hegemony is absent. While establishment of priorities and major funding decisions may lie at the cabinet level (federal), operational guideline determination and approval will be found at the provincial level.

Objectives. The general objectives for the development of southwestern Ontario are stated as follows:[12]

1) Economic growth should be based on private industrial development which combines regional diversification with subregional specialization;
2) urban growth should be decentralized in growth nodes so as to maintain economies of scale and at the same time limit sprawl;

3) a transportation system should be established which links the urban centers - such a system should in part shape future development not simply respond to past requirements;
4) environmental protection is necessary for the region's shorelines, escarpment and prime agricultural lands;
5) flexibility; and
6) encouragement of local participation at each stage of the planning process.

Surveillance. Initially, ten economic regions were delineated in Ontario for purposes of data collection or surveillance. These regions conformed to existing administrative boundaries. Here the intent was to take advantage of data gathered previously. Later, ten regional plans were deemed too many for purposes of planning coordination, (i.e., some fluidity was to be gained if regional size within Ontario was increased), and the number of regions consequently was reduced to five.

In 1967, the Regional Development Branch commenced systematic data accumulation so that trends could be ascertained. Sixty-three indicators of social and economic change were analyzed for the period 1951-1966.

It may also be noted here that a land inventory (similar to New York State's LUNR) has been established by the Agricultural Department in Ottawa under federal-provincial agreement. The intent is to use this information for gross land use planning in each province. Initially the Canada Land Inventory is looking at four criteria: (1) agriculture; (2) recreation; (3) wildlife; and (4) forestry. Eventually the inventory will be computerized for easy access and retrieval.

Mediation. The mediation function is to be carried out under the following principles:

1) There should be linearity, or alignment, between growth nodes to facilitate major transportation links and allied services.
2) There should be a functional utility between urban and rural areas. Each has a contribution to make to the other. For example, one serves as a cultural source, the other as a source of outdoor recreation. Economically, complementary products are produced.
3) There should be linked sub-centers within the Region. This will foster decentralization.
4) There is need for open space land areas of recreation.
5) Resource conservation, of land, air and water is a necessity.

Control. Enforcement of guidelines rests with the province. Enforcement is based upon the concept that development within approved areas will be guaranteed government supported services, (e.g., main access roads, utilities, schools, transportation facilities...), while development outside of approved areas will have no such guarantees. Primary control is thus established through the public spending power, though direct enforcement (police power) is also a possibility through existing law. Under such a situation, a developer might be denied the right to dispose of sewage, to bring in water, or to build high-rise. Injunctions, though rarely used, are also a possibility. Local appeal of provincial determinations is possible through a federally-appointed panel of arbitrators.

In reality the control function appears to be less firmly established in Canada than in the United States. The application of positive zoning has

not been widely carried out, nor are there land use enactments other than the one cited regarding the Niagara Escarpment. Taxation has not been used as a regulatory device nor are there provisions for agricultural assessments.

In spite of these limitations, the action phase of the planning process has been initiated for the Toronto Centred Region, an area encompassing a 90-mile arc around Toronto. This region contains over half of Ontario's population and occupies a pivotal position geographically within the province.

Areal Concept. Three concentric zones have been delineated:

Zone 1. A lakeshore urbanized area. This is centered about the present metropolitan area.

Zone 2. A commutershed. The policy here is to retain a premium on open space, recreation and agricultural lands.

Zone 3. A peripheral area.

Provisions (as yet undefined for various reasons), have been made for a Parkway Belt system and for recreation areas. The unique feature of the Parkway Belt system is the concept of maintenance of wide corridors of open land, to provide transport and/or utility services and also to prevent communities from growing together into urban sprawl. The corridors will also serve as environmental buffers, to diminish noise and diminish adverse visual impact.

Planning Status. Reaffirmations of the principles of the Toronto Centred Region have been made as recently as April 1971. "The government has decided to endorse the principles of this basic plan as the guideline for provincial decision-making in the Toronto-Centred Region".[13]

Summary. In summary, regional development in Ontario as evidenced by planning for the Toronto Centred region has begun. Much surveillance has been completed; mediation has been initiated. The fact that there is a plan - with general governmental and public support - speaks well for the process.

Three areas of potential weakness are noted:

1) While planning is integrated from a regional standpoint, it is not integrated from a resource standpoint. This is essentially a land plan. Regional planning should encompass land, water, and air planning.
2) As yet there has been little need for control. Ontario hopes that regulation can be effected through the public spending form of regulation, i.e., incentives. It is doubtful if this will be adequate.
3) The tempo of deleterious change in populations, urban sprawl, loss of agricultural lands, environmental damage calls for plan implementation at an early date. There is an urgent need to get on with the task.

Land Use Issues

Land Use Requirements.

a) Ontario In 1964 there were approximately 200,000 acres of built-up land in the Basin and adjacent to the lake, excluding areas such

as Guelph and Barrie. The population density was 8,200 persons per square mile. (By way of comparison, the west side of Manhattan Island has a density of 160,000, while the density in a typical area zoned for acre lots would be about 1000.) The gross residential area was estimated at about 120,000 acres. By the year 2000, land taken up for residential areas alone is expected to total 260,000 acres. This does not include non-residential intensive uses such as transportation links, parks, industrial sites, shopping centers, and institutions.

Projected urban land use requirements to the year 2000 have also been made by MTARTS (Metropolitan Toronto and Region Transportation Study) for a region encompassed within a 60-mile radius from downtown Toronto. This area includes Guelph and Barrie but excludes St. Catherines and Niagara Falls. The results of these studies are briefly summarized in Table 9.

Table 9

	Built-up Area (Acres)	Density (Persons/Sq. Mile)	Residential Area (Acres)
Low Density Assumption-2000	592,000	7,000	403,000
High Density Assumption-2000	412,000	10,000	223,000
1964	220,000	8,200	123,000

b) New York Allee's report projects urban land requirements for the following counties: Niagara, Erie, Wyoming, Orleans, Genesee, Wayne, Livingston, Monroe, Ontario, Yates, and Seneca.[14] For projection purposes, these counties are taken to be representative of the Lake Ontario Basin area. For the 20-year period 1965-1985, requirements in acres are as

follows: housing - 63,000; commercial and manufacturing - 19,000; other - 18,000. The derivation or original uses of this land is predicted to be as follows: openland - 59,000; cropland - 36,000; woodland - 5,000.

c) Observations It can be noted that over half the built-up area will go for residential uses. Typically, streets and highways rights-of-way take up about 1/5 of the developed land, and commerce, industry, utilities and institutions occupy another 1/10 to 1/5 of the land.

Zoning ordinances may in the future push minimum lot sizes to larger acreages. This will lead to lower densities and higher land use requirements. Even under extreme conditions, (low density assumptions), availability of land will not present a barrier to urban growth in the Basin in the foreseeable future. To the year 2020, more than 3/4 of the land will still be vacant or in parks. Core areas will of course have a very high percentage of developed land.

Conversion of Rural Land to Urban Uses. Urbanization occurs at the expense of rural areas. Some of this rural land will possess a high economic potential and its conversion will be in response to a higher marginal utility of the land for urban purposes. Loss of prime agricultural land, though perhaps unfortunate in many ways, will not result in a loss in total farm production. The slack will be taken up elsewhere. Loss of forested land will be offset by replanting in or exploitation of other areas. However, the value of rural land in the vicinity of cities is not to be measured solely in economic terms, but more in their location in time and space when used in conjunction with planned development.

Several studies in the United States and in Canada have quantified the tradeoffs between growth of urban areas and loss of rural land. The methodology for this type of study was pioneered by Donald J. Bogue, who

posed the question, "...how many acres of land are removed from agricultural production per 1000 population increase?"[15] The answer to this question might be sought in one of two ways: (1) determine population growth and growth of urban areas; or (2) determine population growth and loss of land in non-urban uses. Although it may seem indirect, the latter approach is preferred in that it underlines the impact of urbanization upon potential loss in food production and also the social impact due to loss of open spaces. Simply, Bogue and others have noted population growth from one census to the next and have related it to loss in acreage of agricultural, open, and forested land in the vicinity of metropolitan areas.

One may rightly ask if a direct cause and effect relationship exists. Certainly not all the exodus from the farming scene is directly related to urban growth even in areas adjacent to cities. Some farms are no longer operated because they are simply uneconomical. But it has been shown that the greatest loss of farmland is closest to the central city and the loss decreases as the distance from the core increases. Clawson et al., have shown that for every two acres withdrawn from rural use, only one goes into development. A primary cause of this is the speculative pressures on the land applied in an economic sector where returns are only marginal. Also, one might add to this the effect of rapidly rising property taxes in rural areas adjacent to the cities. Thus, although there are other factors contributing to conversion of rural land to non-rural uses, the most likely cause, in and around growth centers, is urbanization and industrial growth and the pressures created by them.

A. Land Speculation

With increasing urban sprawl, land values on the periphery will continually increase, driven upward in value by the activities of speculators and land developers. The number of acres converted to urban uses is less than the conversion out of active agriculture. This implies land available for recreation, preservation and open space, but it also reveals the speculative pressures on the land. Urban growth in New York State has required some 10,000 acres of cropland annually. At the same time, land speculation has idled several times this figure of productive agricultural land in anticipation of urban development. In New York State, some 200,000 acres are removed from active agriculture each year, the majority going to recreational activities.

When projections are made for future land requirements for urban purposes, high and low figures are often given. Assuming a single projected population figure, the difference in the land requirements can be considered to be the land idled by speculation.

B. Taxation Policies

One of the undesirable effects of urban growth on the rural countryside has been the increase in the assessed value of the rural land as a result of reassessment of the land potential for suburban development. In a study involving some growth centers in the Lake Ontario Basin, Hind-Smith noted that agricultural land in urban fringe areas had assessed evaluations 40-60% greater than the farmland outside the shadows. Rural

lands adjacent to new subdivisions will generally be taxed more heavily than they were before they became included within the urban gringe. For example, farmland may be taxed by a public service district for improvements such as sewer, water, lights and non-farm drainage. Under the provisions of the New York Agricultural Districts Law, farmers may band together to seek tax shelter from these types of taxes. They are also entitled to apply for agricultural value assessments on their land and thus exclusion from assessments based upon potential for development. (Farmers not in Agricultural Districts may also obtain agricultural value assessments by entering into contract yearly to keep their land in farming for a period of 8 years.) This legislation recognizes speculative pressures and inequities in land assessments and offers alternative actions to individuals affected. Similar legislation may be needed in Canada.

Higher taxes and speculation combine to idle thousands of acres annually in the Lake Ontario Basin. These financial pressures are engendered by urban sprawl. In this respect, urban growth accelerates the conversion of rural land to non-rural uses. Land is placed on the market in response to financial pressures which are in turn caused by urban growth. The process feeds on itself.

Case Study - Niagara Fruit Belt. Ralph Krueger has made a well-known study of the effect of urban encroachment upon the Niagara Fruit Belt.[16] This is that sector of the Province of Ontario on the western shore of Lake Ontario. He notes a recent acceleration in the retirement of this land from agricultural purposes. This could be especially damaging in that

the area accounts for 25% of the gross value of Canada's fruit production. (The area accounts for 80% of Canada's grape acreage, 60% of the peach acreage, and 50% of the plum, pear and cherry acreage.) Other fruit production areas are scarce or non-existent. The alternative measure is to import fruit from the United States.

The reasons given for conversion of land in the Niagara Fruit Belt are similar to those given for other areas. Increasing property taxes and soaring land prices combine to induce the farmer into selling his land. Land price increases can in many cases be attributed to speculation. With this in mind, even the progressive farmer will be reluctant to make improvements (say new trees) on his land with repayment perhaps five years hence. He may opt to sell his land, or simply to sit tight. Consequently, a side effect of speculation is a decrease in overall productivity.

As yet there is no legislation designed to relieve farmers in Ontario of the price-cost squeeze. Nor do farmers seek this. Growers are in general opposed to provincial planning which might in some way limit their right to sell their land for high price. Some have proposed land use legislation to relieve growers in the area of the financial pressures presently exerted. If planned growth is to take place, this may be a necessity.

The phenomenon of urban development encroaching on agricultural land cannot be viewed in purely economic terms. To do so is to give undue weight to the economic gain resulting from the advent of urban and industrial development in a given area. Other important values are those of preventing unplanned growth, of insuring open space, and of making cities livable. Moreover, if urban growth could be planned, there would be provision for complementary agricultural and metropolitan sectors, leading to economic and social advantages for people in both.

Impact of Land Use Trends on the Natural Environment

Water. Both urbanization and intensive agricultural production contribute to potential water pollution hazards. Intensive agricultural activities, for example feedlots, can lead to excessive concentrations of pollutants in ground waters or to odor and manure disposal problems. Excessive use of fertilizers or pesticides can be a problem since the ultimate sink for both waterborne and airborne pollutants from the Basin is Lake Ontario itself.

Industrial pollution is another serious matter. Liquid wastes are discharged into Basin streams or directly into the lake. Thermal electric power plants use large volumes of coolant water which are returned to the lake at temperatures that can affect the local marine biota. Industrial concerns make a major contribution to air pollution. The location of new industry in the Basin, as well as elsewhere, has in the recent past met public resistance in some cases over these issues.

In rapidly developing regions, it is unlikely that effective lake pollution standards can be realized without parallel land use controls. The necessity for such control is becoming more widely understood in the United States and in Canada. Unfortunately, other public priorities, particularly in the United States, have retarded needed action in this area. Nevertheless, the 1972 Canada-U.S. Great Lakes Water Quality Agreement may promote eventual joint, coordinated efforts in land use management. This is an essential goal because land use cannot be separated from the management of the water resource.

Viewed from the perspective of the total lake environment, as a resource for recreation, fisheries, navigation, municipal use, and so forth, we must be alert to the stresses imposed by dense population

centers adjacent to the lake. Prudent management of the land is the only effective solution to protection of the water resource.

Land. Where intensive agricultural operations exist adjacent to urban areas the environmental stresses may become particularly acute. This may be partially offset by the desirability of having open spaces adjacent to urban areas. There is much that technology and education can do to obviate potential problems.

This is not to say we should become complacent on this issue. Some of the best scenic areas have been and continue to be developed and spoiled with little regard for public access and use by future generations.

Due to migration into the area, population will increase. There will be increased need for land and water-based recreation facilities and for other amenities which must be provided within the context of regional planning for the area. This will make necessary a much higher degree of land management than that existing today.

Open Space Concepts

Why should areas in the Basin and elsewhere be spared from complete urbanization? Phrased another way, what is the value of open space land?

More People - More Leisure. The United States will have more than 300 million people by the year 2000. Rochester and Buffalo will grow by more than 200,000 and 300,000 people, respectively, in the next 15 years. The Mississauga complex is expected by some to increase by 1.5 million people in the next 15 years. These larger populations will surely spell more use of recreational facilities. Simply maintaing the present

ratio of recreational acreage to population will not suffice to accomodate recreational demand because people will (presumably) have available more leisure time. The pressures will be great for placing large areas into recreational use. The National Recreational Association which formerly recommended at least 10 acres of metropolitan park space per 1000 population, now suggests a minimum of 15 acres.

Concern for the Environment. This concern has been growing among citizens of both countries. There is a strong movement to reserve lands within urban areas for conservation purposes. Cited are areas such as creeks and flood plains (both for scenic values and to reduce the need for expensive flood control projects). Urbanization threatens not only scenic areas but it also endangers the existence of wetlands. The wetlands are major sources of food and are breeding grounds and the favored habitat of an enormous variety of birds, fish and wildlife. These land areas are generally low-lying and historically cheap in land market value. They offer the builder certain cost and location benefits for development which are frequently in direct conflict with ecological concerns. If used intelligently, they can serve as recreational areas or as physical barriers to unrestricted development.

Pollution Control. Open space land may ameliorate pollution of two types. Visual pollution, a resultant of unplanned urban and suburban development, can be prevented or reduced by leaving certain acreage undeveloped to serve as barriers to unrestricted growth and also perhaps as transportation and utility corridors. Physical pollution of the land and the lake can be lessened by reduced density of urban populations. There is a growing awareness on the part of concerned citizens that in the

future there will be a difficult trade-off between absorbing the externalities in the form of pollution and paying the high costs of keeping open space land out of private hands. In addition to ensuring a future adequate supply of recreational opportunities, the public may demand appropriate control over urban sprawl and other forms of pollution.

Mechanisms to Counter Urbanization

Actions have been initiated on both sides of the border to thwart complete urbanization. In New York, Agricultural Districts legislation provides an opportunity for agricultural land to remain competitive in the face of speculation and soaring assessments. It is precisely this question of "rent" - that is, economic return from the land versus speculation and taxation which exercises the major control over changes in land use patterns. Agricultural Districts are a mechanism to suppress speculation and taxation based upon potential for development. No doubt the New York approach will undergo many adjustments over time in order for it to become and remain an effective counterbalance to speculation and taxation. What is important, however, is that it is a start.

Ontario has developed a somewhat different approach. Design for Development is a regional planning program reflecting current thinking concerning economic and social growth in the province. As pointed out above, DFD has established provincial guidelines to be enforced at local levels in order to achieve balanced growth commensurate with planned urbanization incorporating open space and corridor concepts.

DFD is a dynamic process involving continuous re-examination of objectives and means to help secure and maintain a desirable standard of living for all Canadians. As in the case of New York's Agricultural District legislation, it represents only a beginning. And like the New York

mechanism, it reflects a consensus on the part of politicians that planning for growth is an absolute necessity for the years to come. One can be sure that political interest in the planned growth process will expand, not diminish, in the future. (One can also cite recent land use control legislation in Hawaii, Wisconsin and Vermont.)

Unfortunately, broad scale regional planning in New York State has not proceeded as rapidly as in Ontario. In 1974, Ontario has the goals but lacks effective means of achieving planned growth. New York has codified one means, but her planning processes lack the scope of those evidenced in Canada. It would seem that both New York and Ontario would stand to gain from a joint review of each other's experiences to date in the matter of land use control.

What can be done to make land planning more effective?

1) Improve the skill of planners through research and education.
2) Institutionalize the planning process at all government levels - organize for broad scale regional planning.
3) Sharpen surveillance systems to give better information re: economic analysis, ecological impact, human desires.
4) Provide enforcement mechanisms such as voluntary conservation agreements, land use zoning, control over public improvements, pricing of public services, changes in tax laws, purchase of open space land.
5) Make the financial commitment to achieve these ends.

Concerted Action on Land Use

One might raise the possibility that planning goals and mechanisms might be made uniform or at least compatible over the land area in Canada and the United States within the Lake Ontario Basin. No doubt there would

be considerable hurdles to overcome. But the areas of commonality between the two countries and provinces/states stand out. If such an arrangement could be made to work anywhere in the world, it would seem that it could be made to work here. The effort required to bring it about would be prodigious, but the rewards would be great. Open land in New York could be held in trust for urban centers in Hamilton, and Toronto. The Niagara Fruit Belt area in Canada could continue to be a preferred site for tourism from both sides of the border. Wilderness areas north of Toronto would continue to be protected for citizens of both nations. Growth centers such as Buffalo and Toronto might somehow be made more available to citizens of the other country as centers for commerce, culture, education and housing.

Chapter X

Footnotes and References

1. Udell V. Haas, 288 NYS 2d 888, 893, 21 NY 2d 463 (1968).

2. See Mandelker in N. Marcus and M.W. Groves, ed., The New Zoning: Legal, Administrative, and Economic Concepts and Techniques, Praeger Publishers, 1970, p. 16.

3. Fred Bosselman and David Callies, The Quiet Revolution in Land Use Control, prepared for the U.S. Council on Environmental Quality, GPO: Washington, D.C., 1971.

4. J.H. Beuscher, Land Use Controls - Cases and Materials, University of Wisconsin, 1964, p. 515.

5. Id., p. 563.

6. Id., p. 565 (Seligman).

7. See Beuscher for a more complete account.

8. See article by Woodbury in Ackerman, J., M. Clawson, and M. Harris, eds., Land Economics Research, Symposium at Lincoln, Nebraska, sponsored by Resources for the Future, 1961, p. 66.

9. Id., pp. 68-79 (Woodbury).

10. L.O. Gertler, Resources for Tomorrow, Report of Conference in Montreal, Agriculture, Water and Regional Development, October 23-25, 1961, p. 396.

11. See A Strategy for Southwestern Ontario Development, Joint statement by the Department of Treasury and Economics and the Dept. of Municipal Affairs, March 1970, p. 1.

12. Id., pp. 14-15.

13. W.D. McKeough, Design for Development: A Status Report on the Toronto Centred Region, August 1971, p. 2.

14. D.J. Allee, et al., Toward the Year 1985, Special Cornell Series Number 8, The Conversion of Land to Urban Use in New York State, Cornell University, Ithaca, N.Y., 1970.

15. D.J. Bogue, Metropolitan Growth and the Conversion of Land to Non-Agricultural Uses, No. 11, Scripps Foundation Studies in Population Distribution, Oxford, Ohio, 1956.

16. R.R. Krueger, The Disappearing Niagara Fruit Belt in Regional and Resource Planning in Canada, R.R. Krueger, ed., 1970.

CHAPTER XI

THE NIAGARA FRONTIER: PROBLEMS AND OPPORTUNITIES*

Introduction

The four international Great Lakes are linked by three connecting channels at which locations the national territory of Canada and the United States are separated, with the exception of Lake St. Clair only by the width of a river. These are known as the frontier areas and as such they pose special problems and offer unique opportunities to the cause of improved resource management in the Great Lakes region. In this chapter we shall examine one of these frontier areas, the Niagara Frontier. The focus of the analysis is on the institutional problems at two levels: at the inter-county level on both sides of the Niagara River and at the regional or frontier level. Also included is a discussion on how the new organization, through the Lake Basin Office concept (see Chapter VI), might relate to a particular frontier area.

The Frontier Areas in Perspective

The frontier areas represent urban concentrations that exist on each side of the connecting channels. (See Figure 6) In terms of population

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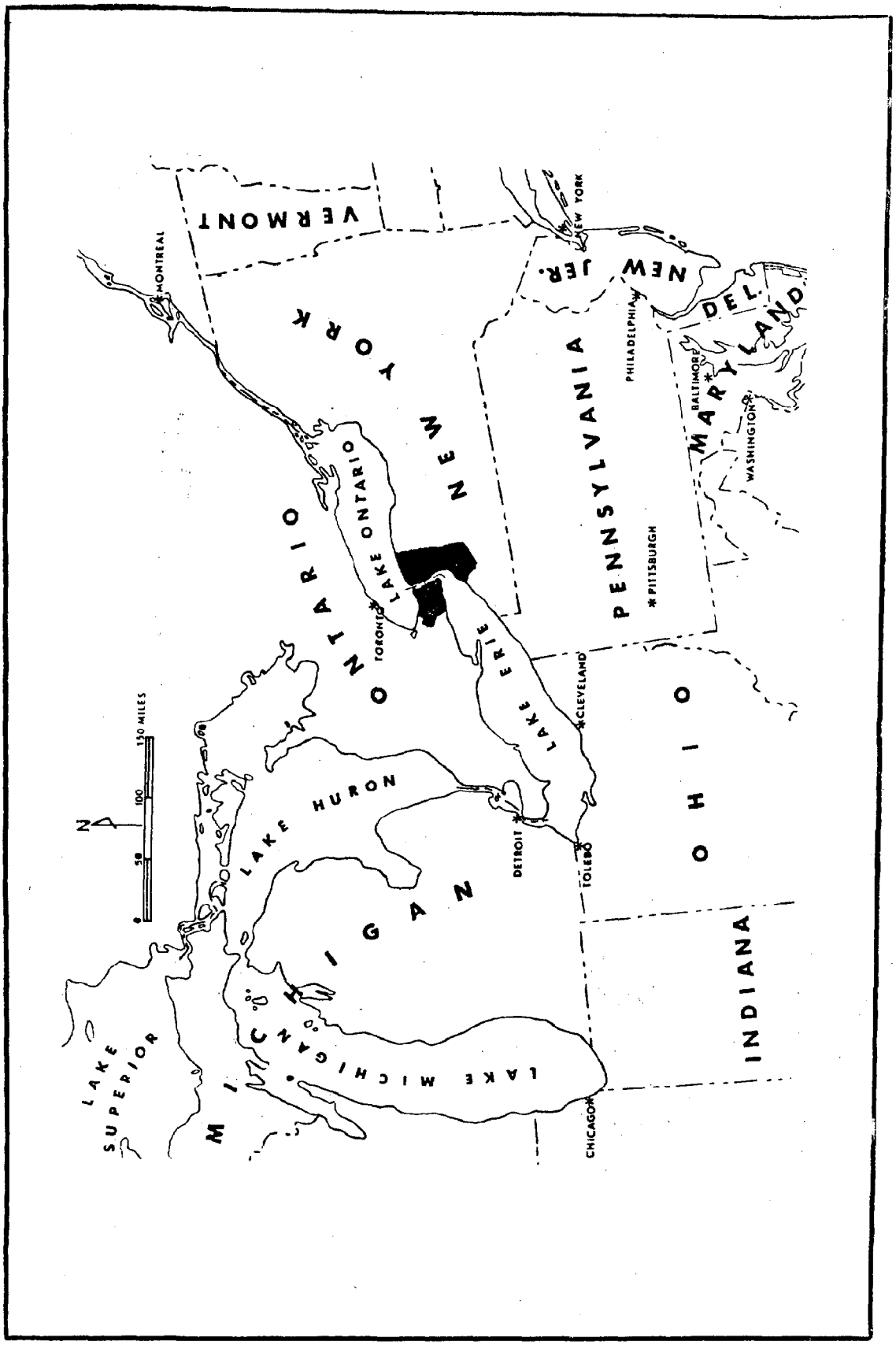
*This chapter is based in part on original research done by Donald R. Kisicki for his master's degree thesis entitled, Environmental Management of the Great Lakes International Boundary Areas - A Case Study of the Niagara Urban Region, 1973, Cornell University.

and industrial activity, the connecting channels between Lakes Huron and Erie on which are located the cities of Detroit, Michigan and Windsor, Ontario are the most important. The population on the U.S. side was approximately 4,500,000 in 1970 and is expected to double in the next fifty years. On the Canadian side, the 1966 population of the three counties bordering the frontier was approximately 500,000 with projections of 760,000 for the year 2001.[1] The second most populated frontier area is located on the shores of the Niagara River and includes the cities of St. Catherines and Niagara Falls, Ontario as well as Niagara Falls and Buffalo, New York. The U.S. population of the region in 1970 was 1,350,000 and the Canadian population in 1966 was approximately 350,000.[2] The third and least densely populated frontier area is located on the St. Mary's River between Lakes Superior and Huron. The principal cities are Saulte Ste. Marie, Ontario with a 1966 population of 74,600 and Saulte Ste. Marie, Michigan, population of 18,500. Although these populations are expected to double during the next fifty years, the St. Mary's frontier would still not represent a major urban concentration.

The Niagara River

The Niagara River is 37 miles long delivering flows of 200,000 cubic feet per second. The river is probably best known because of the world famous Niagara Falls and for this reason the area has received much attention with regard to preservation and enhancement.

Figure 6


VERMONT
NEW YORK
NEW JER.
DEL.
MARYLAND
PENNSYLVANIA
OHIO
INDIANA
MICHIGAN
ONTARIO
MONTREAL
NEW YORK
PHILADELPHIA
BALTIMORE
WASHINGTON
PITTSBURGH
TORONTO
LAKE ONTARIO
LAKE ERIE
CLEVELAND
DETROIT
TOLEDO
CHICAGO
LAKE HURON
LAKE MICHIGAN
LAKE SUPERIOR
N
150 MILES
100
50

The Falls divide the river into an upper and lower portion. In the upper portion the river is also divided into two channels by Grand Island. These divisions produce significant effects as to transboundary movements of pollutants.

Between industrial and municipal uses, the river and its tributaries provide almost a billion gallons per day of water, mostly for use on the U.S. side.[3] Municipal and industrial wastes from both sides of the border are discharged to the river and again the United States is the largest contributor.

Major industrial discharges into the river include chemical, steel, abrasives, paper and oil refining wastes. Dye manufacturing and alkali-chlorine production constitute a major portion of the chemical industry in the area. A large portion of the waste load on the Niagara River is contributed by the slow moving, heavily polluted Buffalo River.

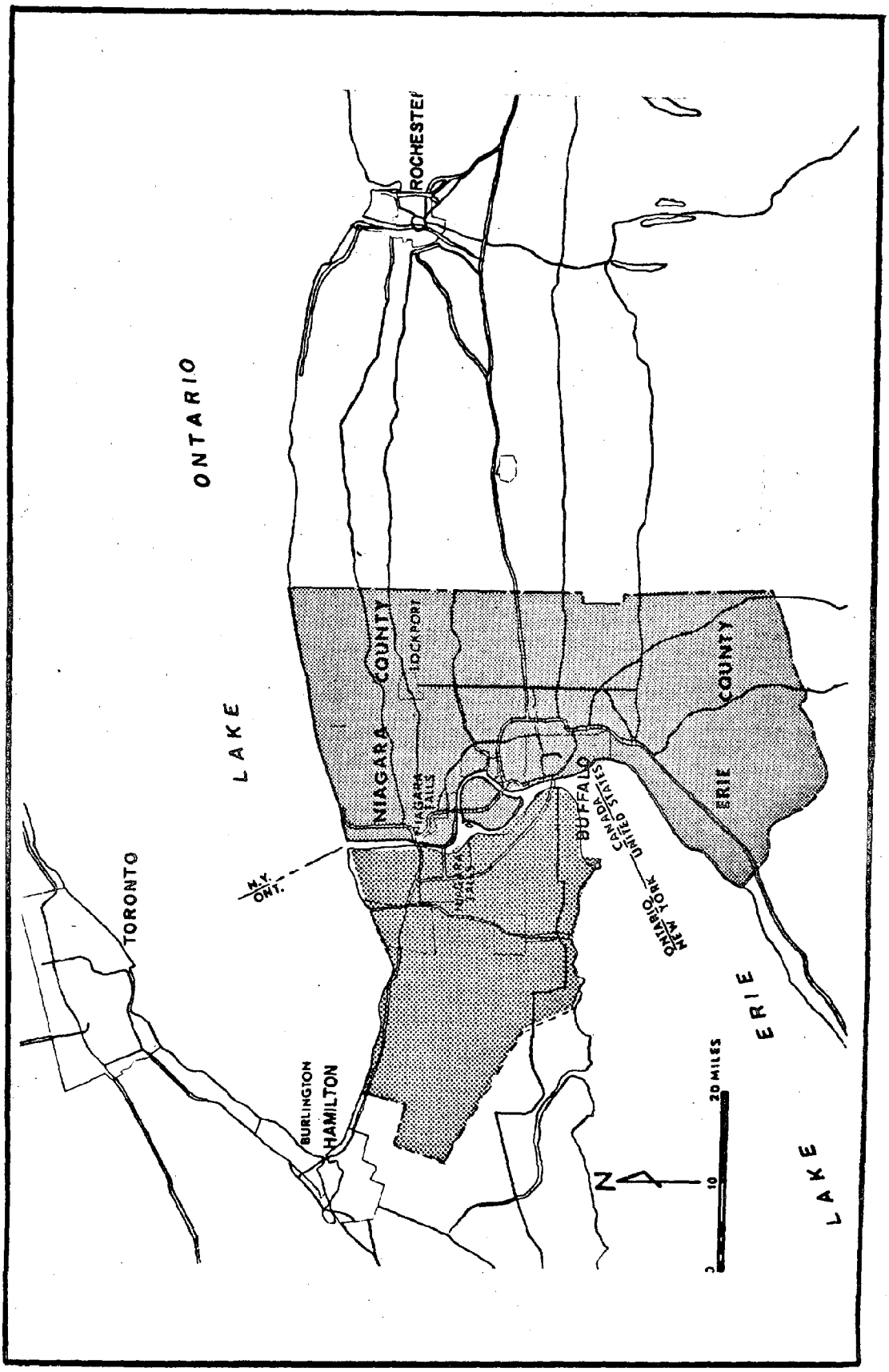
The Niagara River also provides important benefits in the form of recreation and tourism. In addition to Niagara Falls, which is the major tourism attraction in the area, fishing, sailing, and waterfowl hunting are also important recreation uses of these waters. Pollution has caused the closing of beaches on Grand Island in recent years.

The Niagara Frontier (Figure 7)

Canada

The Niagara Peninsula is one of the fastest growing regions in the Province of Ontario. Its sustained growth can be attributed in large part to three factors: favorable location in the large central Ontario market area; its proximity to the United States; and the presence of a combination of unique natural resources including tender fruit soils, tourist

Figure 7 - The Niagara Frontier



attractions, and extractable mineral resources. The major urban centers are Niagara Falls, St. Catherines, and Welland. The counties of Lincoln and Welland which border the Niagara River formed in 1970 the Regional Municipality of Niagara (RMN). Land use at the present time is approximately 80 percent urban in the RMN. The trend of increasing urbanization is expected to continue with the present population of the RMN of 350,000 projected to reach 500,000 by the year 2001. This estimate is considered a conservative one. The growth pattern has been in an arc stretching from the northwestern end of the Municipality around the southwestern shore of Lake Ontario to Niagara Falls.

The highest densities of population in the RMN are in the north and east sections,mostly in the former Lincoln county. The rapid rate of growth has been a result of its location (between Wentworth and Welland counties), the effect of the Niagara Escarpment, and the location of transportation routes such as the Queen Elizabeth Way (Q.E.W.). This area has experienced a population growth of 64 percent between 1951 and 1966 and is exhibiting the trend common to a large part of Southern Ontario of concentrations in urban centers plus growth of rural non-farm population in areas accessible to established urban centers.[4]

The rural sections of the northern portion contain the peninsula's specialized fruit growing zone and many of the region's workable non-metallic mineral deposits. While the concentration of population in this area has produced benefits due to economies of scale, it also has yielded certain disamenities. The process of urban growth has eroded much of the acreage of the fruit growing zone; the extraction of mineral deposits has defaced the Niagara Escarpment; and the general pollution of the area's water resources are directly attributable to the high concentration of activity in this area.

The southern portion of the RMN is presently not as developed as the northern portion. There is no reason to believe, however, that its development is any less inevitable than that in the northern portion.

The loss of fruit lands not only affects the agricultural base, but also detracts from the recreational aesthetics of the fruit belt. Uncontrolled development in this area can only further endanger the recreational potential. With regard to recreational areas, water pollution is causing problems as are industries that are defacing scenic areas (such as the Niagara Escarpment), raising conflicts between the exploitation of non-renewable resources and recreational and visual amenities. The excessive development of tourist-related construction such as billboards and high rise facilities is diminishing the appeal of prime tourist attractions such as Niagara Falls.

Increased population and lack of coordinated development of private and public facilities will further add to the conflicts mentioned above.

The projected population for the RMN to the year 1991 will be between 421,670 and 553,329 depending on the fertility and migration rates used.[5] This will represent an increase of between 30 to 70 percent over 1966 population levels. Whatever population statistics are used, the result is clear: a fairly rapid growth rate will occur during the next twenty years and the Niagara Frontier will form part of the emerging Great Lakes megalopolis, thereby placing severe stresses on the region's natural environment.

United States

The U.S. portion of the Niagara Frontier, consisting of Erie and Niagara Counties, New York, centers around the major hub of the City of Buffalo which owes its present significance and growth potential to its

proximity to the Great Lakes and its position as a focal point for air, rail and highway transportation to markets in the eastern United States and in Canada.

The area accounts for 7 percent of total New York State employment, concentrating on primary metals, heavy chemical, and machinery industries. Although new or expanded industry has entered the area the majority of plants are old. New industry, particularly in transportation equipment, and the rapid growth of research industries are expected to stimulate new industrial development in the region.

The populations of Erie and Niagara Counties are projected to increase from a 1970 level of 1,350,000 to a 1990 level of 1,660,000 or a 22 percent increase in that twenty-year period.[6]

Although the Erie-Niagara County region has been described as urban, the bulk of its land area is not utilized for urban purposes as 84 percent is vacant or used for agricultural purposes. Past and present trends indicate that urban land use is extending to the north and east from Niagara Falls in Niagara County and to the northeast and east from Buffalo in Erie County.[7]

This anticipated population increase can be expected to place added development pressures on the eastern Lake Erie and western Lake Ontario plains and on the entire U.S. section of the Niagara Frontier.

Combining the U.S. and the Canadian portions of the Niagara Frontier shows that the area will be supporting a total population of 2.1 million by 1990, representing a 25 percent increase over present levels. By the year 2020 it can be anticipated that the total population will reach close to three million. Demographic studies indicate that the NF will form an integral part of an international megalopolis running from Chicago

to Montreal and encompassing nearly all of the land around the lower Great Lakes.[8]

While the types of urbanization and industrialization may differ somewhat in both countries, the overall impact on the environment will be the same. The conflict between the primary resources (land, water and air) and development will sharpen and will challenge our institutions and political leadership as they have never been challenged before.

The Regional Municipality of Niagara

The Regional Municipality of Niagara (RMN) is a two-tiered governmental system consisting of a regional tier, governing on a broad scope the former Lincoln and Welland Counties, plus a local tier consisting of 12 area municipalities which govern on a local basis. Formerly there were 26 municipalities within the two counties; under the reorganization these were reduced to 12.

In setting up the RMN the Ontario Department of Municipal Affairs realized the great need for coordination between both tiers of government.

> "The need for continuous coordination between both tiers of government in the region cannot be overemphasized. Issues facing the entire region will affect local area municipalities. Similarly, decisions made by the area municipalities may often affect the region. Local water, sewers, road development and other decisions cannot be separated from related decisions at the regional level."[9]

To provide this type of coordination the Regional Government is headed by a Regional Council composed of 29 members including the chairman. Membership on the Council comes from within the area municipalities; members are directly elected to serve on the Council and their number is determined by the population of the area municipality. Population, and members from each area municipality were, as of 1971:

TABLE 10

Membership of Regional Council

Area Municipality	1971 Population*	Membership
St. Catharines	110,000	Mayor + 5 members
Niagara Falls	65,000	Mayor + 3 members
Welland	44,000	Mayor + 2 members
Fort Erie	23,000	Mayor + 1 member
Port Colborne	21,000	Mayor + 1 member
Grimsby	16,000	Mayor + 1 member
Thorold	15,000	Mayor + 1 member
Lincoln	14,000	Mayor + 1 member
Niagara-On-The-Lake	12,500	Mayor + 1 member
Pelham	10,000	Mayor
West Lincoln	8,000	Mayor
Wainfleet	5,500	Mayor

* figures rounded

The concept of having local officials serve on the Regional Council has perhaps the disadvantage of increasing their workload, but this disadvantage is greatly outweighed by the officials becoming better informed on issues facing both regional and local governments.

The following table indicates the responsibilities of the Regional Council and those of area municipalities:

TABLE 11

Regional and Local Functions of RMN

	Regional	Local
Water		
Supply & Purification	X	
Distribution	X	
Const. & Maint. of Transmission Mains	X	X
Water Regulations & Standards	X	
Inspection of All Water Mains in Region	X	
Sewage System		
Wastewater Treatment	X	
Construction & Maint. of Sanitary and Storm Trunk Sewers	X	
Separation of Storm & Sanitary Sewers	Costs shared (25% max. regional contribution)	
Const. & Maint. of Local San. & Storm Sewers		X
Regulations & Standards for All Sewer Connections to Regional System	X	
Inspection All Sewers	X	
Roads & Traffic		
Arterial Roads	X	
Planning, Const. & Maint. Powers	X	X
Local Roads		X
Traffic Control	X	
Sidewalks		X
Parking	X (regional roads)	X (local roads)
Health & Welfare		
Board of Health	X	
General Welfare Assistance	X	
Homes for Aged	X	
Child Welfare	X	
Juvenile Delinquency	X	
Nurses & Day Nursery	X	X
Ambulance Service		X
Mental Hospital	X	
Police		
Board of Commissioners	X	X

TABLE 11 (continued)

	Regional	Local
Finances		
Tax Collection		X
Regional Tax Levy	X	
Local Tax Levy		X
Regional & Local Borrowing	X	
Other Functions		
Solid waste		X (may make arrangements to have region handle waste disposal)
Fire		X
Appointments to Conservation Authority	X	
Park lands		X
Recreation & Comm. Centers		X
Expenditures for Promoting Regional Area	X	
Public Transportation		X

The main functions necessary to protect and enhance the environmental resources have been delegated to the regional government. The regional government not only has the power to plan but it also can implement its programs.

The most important functions with regard to the physical environment are those functions that either directly affect the quality of environment such as pollution control, parks, recreation, conservation, land use, planning, or those that indirectly affect the environment through either fiscal or administration capabilities to carry out programs or that affect growth patterns such as water and sewer distribution and roads.

Direct Environmental Control Functions - RMN

Sewage Treatment. The Regional Council has the responsibility for design, construction, maintenance and operation of sewage treatment plants. The Council has authority to collect fees to pay all or part of the costs of construction and operation of such facilities on approval of the Ontario Municipal Board.

Parks, Recreation, and Conservation. The Regional government has responsibility for the regional park system and some related recreation and conservation. The parks, recreation, and conservation system is rather complex in Ontario; therefore it was necessary for the Regional Council to distinguish which parks are regional in character. Also the Province is divided into conservation authorities, RMN being part of the Niagara Peninsula Conservation Authority. The Regional Government represents all area municipalities on the Authority.

Fiscal Capabilities. The Regional Council has sole authority for obtaining financing of capital expenditures for regional or local purposes. It can therefore obtain financing at the least possible cost and provides for a unified, long range capital works program in a rational setting of priorities. In other words, the Regional Council has sole authority over all capital expenditures done for either regional or local purposes.

Control of Growth Pattern Functions

Planning. With regard to framework planning, the regional area is a joint planning area with local area municipalities being subsidiary planning areas. In regional planning the Regional Council exercises the duties and

responsibilities of a planning board. The local area municipalities are considered to be the planning board for their respective jurisdictions. The Ministers' powers of approval under the Planning Text may be delegated to the Regional Council. The Regional Council of Niagara is to submit an Official Regional Plan to the Provincial Government before December 31, 1973. Local plans must conform to the regional plan.

The Regional Council is responsible for developing and updating a comprehensive land use and development plan for the region recognizing that local planning boards cannot be expected to create an integrated plan that will provide the broad scope necessary for sound and continuous planning at the regional level to resolve land use conflicts between specialized agricultural, industrial, and residential land uses.

The American counterpart to this regional planning body is the Erie and Niagara Counties Regional Planning Board (ENCRPB).

Water Treatment and Distribution. The supply and distribution of water, including major mains, on a wholesale basis is the exclusive responsibility of the Regional Council. The distribution of local mains is left to the area municipalities.

Major Sanitary and Storm Trunk Sewers. The design, construction, and maintenance of major sanitary and storm trunk sewers and drainage outlets is the exclusive responsibility of the Regional Council.

Regional Roads. The Regional Council is responsible for the construction, repair, and maintenance of arterial roads and highways, including all former county and suburban roads, local area municipalities are responsible for local roads.

Advantages of the RMN Regional System

The Regional Council of the RMN, therefore, not only has the power to act on problems on a broader scale and with more financial and administrative power than do local governments but also has the power to control growth patterns. This power to control the pattern of growth is very important. If a regional government has the power to direct growth away from high priority problem areas, then it, in effect, has the power to protect a large part of the physical environment.

The local area municipalities are left with control over some functions; they are still responsible for providing such items as fire protection, police protection, local streets, lighting, garbage collection, local water distribution, local sewer distribution, and local parks. These are services of a local nature which are most efficiently handled at the local level.

The lower governments also have an outlet for grievances against the Regional Council. They can appeal decisions made by the Regional Council to the Ontario Municipal Board which is at the Provincial level. This appeal system prevents the Regional Council from becoming too powerful.

The Regional Council is further checked in that its comprehensive plans must conform to the provincial plans for the entire Southern Ontario region. Much of what the regional government does must be approved by such agencies as the Ontario Municipal Board, the Department of Municipal Affairs, and the Ontario Water Resources Commission (now within the Department of Environment), among others. Any plans that the regional government develops can be voided by unfavorable comments by one of these higher agencies as not meeting the overall goals of the province.

In essence, the regional government system, as applied in RMN, provides for not more government, but less. True, an additional tier of government has been added, but the number of jurisdictions has been reduced significantly. Moreover, by entrusting those functions that affect the environment most significantly to the regional government the chain of responsibility has been greatly simplified. In governmental systems where a multitude of agencies and governmental units interact, it is often very difficult to distinguish who is responsible for what. By regionalizing the most important functions this problem has been greatly reduced in RMN.

Because the regional government actually has the combined powers of all the twelve area municipalities, it has the capability to plan and implement on a much broader, comprehensive scope, and with greater fiscal authority.

Benefits are also derived from the provincial level in that now the provincial agencies do not have to deal with 26 individual jurisdictions, but with only one regional government. Likewise the tasks of the area municipalities are simplified. No longer need they plan, finance, construct and operate major facilities. They are thereby released to provide for and be attentive to more specific community needs.

The formation of the RMN also enabled the region to reap benefits in grants payable under the Regional Government Act. This increase in benefits during the first year (1970) was estimated to be $1,300,758.[10]

Formation of the RMN

The formation of the RMN was the fruit of seven years of study, public debate and arduous effort. Subsequent to a preliminary study of the area, locally initiated in 1963, the Ontario Minister of Municipal Affairs announced a full scale local government review to be headed by Dr. Henry

B. Mayo. The initiation of this study was brought about by the work of a local committee known as The Niagara Peninsula Municipal Committee on Urban and Regional Research. The study covered Lincoln and Welland Counties. It was conducted with full public involvement through hearings and widespread coverage by the press, television, and radio.[11] The study was completed in 1966 at which time the Department of Municipal Affairs requested all concerned to study the report and submit reactions to the Department. After careful review of numerous briefs, a proposal for a regional government was made by the Minister in January, 1969. An intermunicipal committee was formed which worked out the details of the new system with provincial officials. On October 6, 1969, municipal elections were held and the new regional government went into operation on January 1, 1970.[12]

It appears that the formation of the regional government was both well planned and well executed. The province actively encouraged citizens and groups to become involved in the decision as to what kind of local government they should have. This dimension of democracy is a basic tenet of Ontario's municipal reform program. Regional governments are only proposed in areas where there appears to be a need and then only following a good deal of study, analysis, and discussion. This type of approach applied during the seven-year study period (1963-1970) and probably was largely responsible for avoiding many of the conflicts and obstacles that would have otherwise arisen. It is also important to note that although the establishment of regional governments in Ontario is done by the province, the need for some type of governmental reform was first recognized by the local citizenry in RMN. In other words, local government reform was clearly desired by the people.

The RMN is not without its problems, however. Included among them are the problems related to the 14 jurisdictions that lost their identity under the reorganization. There is also a major problem surfacing on the distribution of tax revenues. The City of St. Catherines may decide to opt out of the regional government based on a brief presented by the Mayor and members of the city council to the Ontario Municipal Board.[13] The main feature of this dissent appears to be alleged inequities in the present distribution of tax revenues.

Erie and Niagara Counties

The U.S. portion of the Niagara Frontier is composed of Erie and Niagara Counties, New York. Erie County is composed of 3 cities (Buffalo, Tonawanda and Lackawanna), 26 towns, and 15 villages. The town boundaries are contiguous so that every portion of the county outside of the corporate limits of a city is included in a town. This is not unique to the study area but is representative of the entire State of New York.

In 1966, in addition to its cities, towns, and villages, Erie County contained 30 school districts, 33 fire districts, 51 fire protection districts, 315 street lighting districts, 110 sewer districts, 78 drainage districts, 148 water districts, 9 refuse and garbage districts, 2 park districts, 2 consolidated health districts, 4 county districts, 6 housing authorities, and 4 urban renewal agencies.

Niagara County contains 3 cities (Niagara Falls, North Tonawanda and Lockport), 12 towns, and 5 villages.

In 1966, in addition to the cities, towns, and villages mentioned Niagara County contained 10 school districts, 2 fire districts, 12 fire protection districts, 14 street lighting districts, 14 sewer districts, 6 drainage districts, 40 water districts, 9 refuse and garbage districts, 1 consolidated health district, 2 county districts, 4 housing authorities, and 2 urban renewal agencies.[14]

In addition to the above, the two counties of Erie and Niagara contain 64 governmental units plus the two county legislative bodies.

It is readily apparent that the U.S. segment of the Niagara Frontier is governmentally more complex than the Canadian portion. Part of this is due to the population difference which is roughly 4 to 1. With the RMN it is relatively simple to find out who does what and who is responsible for what. The situation on the American side is not so clear. The Erie and Niagara Counties Regional Planning Board (ENCRPB) concluded its 1970 Initial Environmental Survey with the following three points:

1. One agency must assume overall responsibility (control or review) for regional environmental action;
2. Emphasis must be placed on action rather than studies which may or may not refute previous studies;
3. Needed immediately, and apparently not anywhere available, is a documented structure of environmental management - who is responsible for what and how do they exercise their authority in the Erie-Niagara region.[15]

The Planning Board based its conclusion on a survey of 19 agencies with varying degrees of environmental responsibility in the region. That multiplicity of government in both Erie and Niagara Counties has led to certain inadequacies was brought out by the same survey. The following obstacles to solving environmental problems were listed by the agencies involved in the survey:

-Lack of implementation of studies;

-Lack of public concern;

-Lack of sufficient funds;

-Home rule impedes consolidation;

-Exorbitant sewerage and sewage treatment plant costs;

-Multiplicity of planning agencies;

-Lack of uniform penalties for water pollution;

-Apathy of taxpayers to bear the cost of pollution;

-Lack of regional cooperation;

-No citizen interest or representation;

-Lack of leadership

-Narrow-minded local leadership irresponsive to anything except home rule;

-Lack of aggressive programs on environmental issues;

-Lack of innovative regional concepts, e.g., greenbelt and multipurpose utilities;

-No intergovernmental agency coordination;

-Lack of municipal leadership;

-Inadequate municipal resources;

-No true regional approach to problems;

-Home rule attitudes;

-Property tax differential;

-No decisions, only studies;

-Lack of political leadership.

The above indicates that there is a multiplicity of organizations providing various services and that this multiplicity has also limited the number of effective programs, resulted in duplication of services, and resulted in a very evident state of confusion to the local citizen.

Whether or not the time is now ripe for some type of governmental reform in Erie and Niagara Counties may be a debatable matter, but a certain amount of evidence exists that it is. The survey done by the ENCRPB and

the conclusions reported above certainly indicate that a better system of environmental management is needed.

Speaking specifically on the Niagara River the ENCRPB states:

> "There is little doubt over the need for a unified and comprehensive management system for the restoration of the Niagara River. Progress in this direction has been limited, however, because many governmental agencies share managerial and/or environmental control over the river and its shoreline."[16]

The 1971 International Joint Commission report on the Niagara River listed four main reasons why all of the municipalities and many of the industries were considerably behind schedule in treating their waste discharges. Development of comprehensive regional plans took approximately two years to complete and municipalities tended to proceed slowly until the plan was formalized. The regional plan required in many instances two or more governmental entities to develop a joint project. Develop of necessary agreements was particularly time-consuming. More pilot plant studies than anticipated had to be carried out. Industries were unable to proceed with their plans until municipalities had defined their needs in cases where joint wastewater treatment was being considered.[17]

The Erie and Niagara Counties Regional Planning Board

The ENCRPB was established in 1966 by a joint resolution of the legislatures of the counties of Erie and Niagara. It is the only regional entity on the U.S. side of the Niagara Frontier. In its early years, the Board's main functions were certification of local applications for Federal aid and satisfaction of federal regional planning requirements. Under the Intergovernmental Cooperation Act, the Board was designated as the review agency for applicants for Federal funding in Erie and Niagara Counties. The Board was required to submit its plans, programs, and qualifications

for review by the Department of Housing and Urban Development in October 1970 for certification that the Board had fulfilled the requirements that Congress had mandated to obtain HUD grant and loan monies. The Board consequently was certified and this meant that there would be no interruption in the flow of HUD monies to local municipalities.

The initial work program of the Board included economic and population projections, land use inventories, studies on public utilities, parks, recreation areas, open space housing, regional growth patterns, and recommendations on regional development goals and objectives. In addition to the above tasks, the Board produces studies and plans in the following areas: transportation, housing, the environment, project review procedures for Federal grant programs and various feasibility studies for the region.

One misconception about the Board is that it acts on applications for Federal aid to local municipalities. This is not the case. The Board does have the power to review, make comment and recommendations on the application as to whether or not the project is consistent with the regional criteria as mandated by Congress. Thus, the Planning Board does have some indirect power over what the municipalities do within the region since many of the local projects such as water and sewer, roads, and recreation are undertaken with Federal assistance.

The Board is basically a planning organization. It does not have the power to provide services and functions other than planning; it is not authorized to levy or collect taxes; and it is not directly accountable to the voters. The benefits of the ENCRPB are that it develops and promotes programs on a comprehensive (regional) basis. It does not have the authority, except through indirect means, to implement the programs and plans it develops.

In solving problems related to existing environmental pollution, the Planning Board has little authority with which to act. It can survey and report on the current problems, trace sources of pollution, and can recommend courses of action. The Board can recommend that communities develop joint facilities, and indirectly can compel them to do so. As far as solving current problems is concerned, action is left, for better or worse, to the state and local governments. The ENCRPB is relatively effective in developing comprehensive regional plans such as for water and sewer. However, any type of regional system involves agreements between local municipalities as to sharing of costs and other responsibilities. Local governments, even though they may have a comprehensive plan to follow are still left to obtain their own financing, consultants, etc. Faced with inadequate resources, both in terms of personnel and finances, the local municipalities are often incapable of carrying out these tasks.

The Case for Regional Government

A regional government encompassing Erie and Niagara Counties could overcome many of the governmental inadequacies that have been mentioned.

In the fiscal area, because the regional government would have the power to raise its own revenue, it could do its own planning, design, construction, and operation. Agreements between municipalities would no longer have to be negotiated since the entire region would now be sharing in the costs. This is not unrealistic since the whole region shares in the benefits also. Likewise, the negotiations of financial arrangements could be handled more efficiently by a regional government, not to mention the lower interest rates that would be obtainable therewith. In the matter of hiring consultants in the design of municipal facilities, a regional government, having more professional staff, would be in a position to choose more intelligently from a wider range of consultants. Likewise, higher qualified consultants would be attracted by the larger volume of work available.

Another area in which a regional government could operate more efficiently is in the area of obtaining Federal grants-in-aid. A statement from the National League of Cities and U.S. Conference of Mayors indicates that it has become as expensive to put together an application for a $10,000 grant as a $1 million grant.[18] If a regional government were allowed to apply for block grants on a regional basis, the possible savings are obvious.

In solving problems related to controlling development and enhancing the quality of the environment the Planning Board is only partially effective. Again, it has only a limited amount of control and then only over projects that involve Federal funds. While this control is an incentive for the majority of municipal projects to conform to regional plans, it does not cover all the projects that affect the environment. The Board has little or no direct control over private development. A regional government, if granted land use control authority, would have the capability of controlling development in areas that are either high priority protection areas or where high priority problems exist. The ENCRPB through its Initial Environment Study has already defined these areas and has recommended that development be discouraged in them.[19] Actual implementation of the regional land use plan is largely left up to local enforcement of zoning ordinances.

Another important defect with the ENCRPB is in dealing with matters of an interregional nature. It is limited in that it cannot serve as spokesman for the jurisdictions within the region. A regional government, on the other hand, would be empowered to do so and therefore could work on joint programs with counterpart organizations in other regions. The obvious

case in point here is the possibility of intraregional collaboration with the Regional Municipality of Niagara (RMN).

Lastly, the formation of a Regional Planning Board does little to solve the maze of jurisdictions confronting the citizen. It does little to clear up the jungle of governments that a citizen is taxed to support and over which he is presumed to exercise control. A regional government could possibly eliminate eighty percent of the local jurisdictions that confront the voter, making the government more visible and more responsive to the electorate.

The provincial government appears to be the prime mover behind governmental reform in Ontario, although in certain instances, as in RMN, the impetus for reform was first generated locally. However, the fact remains that the provincial government has reasserted its right over control of local government. The cities and municipalities in Erie and Niagara Counties are similar legally to those in RMN in that they exist at the will of the state just as those in RMN exist at the will of the province. The State of New York has not, however, exercised its powers over municipalities to the extent that Ontario has. Political forces which surface so clearly in the New York State legislature, are such that the state may never be able to reassert its constitutional authority at the local level.

There are ways, nevertheless, that the State of New York could provide incentives and impetus for governmental reform. The first step to be taken would be to authorize and possibly fund a local government review much the same as was done in RMN prior to its creation. Before local residents can be convinced of the need for reorganization it is necessary that a careful and thorough study be made as to what the local government capabilities are, what problems face the region, and what the benefits of

reform would be. Also included in this study would be alternatives that reform could take, preferably along the lines of the two-tier approach adopted by the RMN. This local government review, funded by the state, could be aided, to a large extent, by the staff of the ENCRPB.

Federal and state incentives in general have a very significant role to play in prompting governmental reform. In part, the reason why the formation of the ENCRPB encountered little opposition was because some type of regional body like ENCRPB had to be formed so that local municipalities could continue to receive their share of Federal funds. Local governments, therefore, could hardly oppose such a move. It is to the credit of the two county legislatures that a two-county regional planning board was formed, instead of implementing regional planning on a strictly county-by-county basis.

It appears then that there are two opposing forces operating in Erie and Niagara Counties. One force that is dissatisfied with the problems of the area and the lack of governmental action on them. This group would be the easiest to convince that reorganization would have significant advantages over the current system.

The second force, the home-rule group, would tend to oppose reorganization based on the threat to the security of local officials and the visibility of their respective communities. This group will be the most vocal in opposition to reorganization. This group would particularly have to be shown that, under the two-tier reorganization approach, the community would not lose all its identity; that area-wide functions taken over by the upper tier would reduce many of the burdens on the lower tier and allow them to be more responsive to local needs; that consolidation of the special districts would make government more responsive and visible to local citizens; that there would be savings in their personnel and financial

resources if a regional government could apply for Federal grants on a regional basis; and that a performance of certain functions on a regional scale would lead to economies of scale.

The Federal grant procedure requires comment. In the Congressional hearings on Grant Consolidation and Intergovernmental Cooperation a main argument for grant consolidation was that local municipalities, after devoting most of their resources to competition for funds, neglected some of the local needs of the local citizens.[20] Centralizing the grant application procedure into a regional government has obvious advantages in this situation.

Some of the conflicts may be avoided or at least lessened if, in a reorganization attempt, the following points are considered:

1. Initiation of a state-funded local government review in Erie and Niagara Counties listing among other things: the municipal services and functions in the region; present trends and the pressures on local government; review of what local people consider to be the problems of the region; local government units in the region; alternative forms of government including the status quo; and recommendations for reform.
2. Initiation of Federal and state support for reorganization, without which any reorganization attempt is likely to fail, including financial incentives for regional governments.
3. A straightforward, easy-to-read document, including an economic analysis, of the advantages of forming a regional type government in Erie and Niagara Counties.

4. Full public representation and participation through the media and through public hearings at all stages of the reorganization attempt starting with the local government review and continuing through the implementation of the governmental reform.

International Cooperation on the Niagara Frontier

It is our view that the establishment of a multipurpose regional government for Erie and Niagara Counties is a prerequisite for any kind of effective cooperation on the international Niagara Frontier. There is no way the present regional government on the Ontario side (RMN) could relate in any adequate way to the existing 64 local jurisdictions on the New York side. The RMN could cooperate to some degree with the ENCRPB but the latter does not speak for the governments within its area. There is a real and present need for a counterpart organization on the U.S. side.

In addition to improved provision of services and the more rational use of land, air and water resources at the domestic level, the introduction of a regional government on the U.S. side would add an entirely new dimension at the international level. The existence of regional governments on both sides would ameliorate many of the problems of the common pool resource, problems that would normally arise when, as now, a large number of users retain independent rights to the use of the resources and when, as now, voluntary agreement or willing consent of every user is required in joint action involving the community of users. In addition to cutting down drastically on the present total randomness of the local government apparatus on the U.S. side, the formation of two coequal regional government entities, one on each bank of the Niagara River, would make possible for the first time meaningful cooperation across the international boundary.

The forms of cooperation envisioned include the following:

Information Exchange

Joint Planning

Joint Public Hearings

Joint Recommendations

Information Exchange. Actual joint studies could be carried out on shared resources such as the Niagara River, Lake Ontario at the land/water interface and offshore, and air pollution. While each side would continue to carry out studies primarily of interest to it alone, the other side should have the opportunity to participate in observer status or at least be informed of significant findings. The idea is to make possible opportunities for comparison of techniques and results as well as to standardize reporting in order to facilitate comparison. Information exchange could take place on an informal basis without imposing additional burdens on existing agencies of either party.

Joint Planning. Planning agencies of both countries must recognize that their plans are not only of concern to the citizens within their own boundaries but of concern also to those citizens across the river. There should be established a close working relationship between the agencies assigned planning responsibilities on both sides. It is assumed that there would be one primary planning body on each side. These planning bodies could play a key role in the coordination of federal, state/provincial planning efforts affecting the Niagara Frontier. These planning bodies could also, under the policy guidance of their respective regional governments, serve as official sources of regional planning input to the proposed Great Lakes Operations Office through the Lake Basin Office

established under Phase II (see Chapter IV). The two planning bodies could also recommend and, if approved, set up both short range (5 years) and long range schedules of priority for the NF and set the basis for the joint collection and analysis of basic data relating to these priorities.

Joint Public Hearings. It would seem essential to provide the maximum opportunities for the exchange of ideas and opinions, not only of politicians, experts, and administrators, but also from the general public. Both regional governments should give serious consideration to an agreement providing for the advertisement of public hearings on both sides of the border and the opportunity for citizens of both sides to participate and submit material for the record.

Joint Recommendations. Because regional (local) governments are more knowledgeable about the problems and needs of their areas, they are in the best position to make recommendations to their respective state, provincial, or federal agencies. Again, however, there are benefits of preparing joint recommendations on common problems and needs. This may result in making governments on both sides aware of the common problems and needs of the Niagara Frontier. Joint recommendations, endorsed by both regional governments, would tend to promote the international importance of the regional priorities.

Interface with the New Organization

Any further move toward unification of U.S. and Canadian political units on the NF beyond those already outlined should be developed within the framework of the International Joint Commission and the Great Lakes Operations Office apparatus. The new bilateral organization would be represented beginning with Phase II by the Lake Basin Office for Lake

Ontario. It is plausible that the new treaty establishing the new organization would contain provisions authorizing or at least encouraging the creation of a combined body that could speak for an entire frontier region. In other words, in the case of the NF, there would be a single binational entity representing both the RMN and its New York counterpart government which would be, in effect, the primary advocate for the NF before the proposed new binational organization for the Great Lakes. Perhaps this is an unnecessary refinement. It may create more problems than it would solve. If the Lake Basin Office idea is implemented with care and intelligence, it would seem that a competently run office could easily accomplish its mission by dealing with two regional government, one on each side of the river. The essential point to keep in mind is that no such office, no matter how excellent its leadership, could deal with one regional government on one side and 64 jurisdictions on the other. In our judgment, the three-sided arrangement (Lake Basin Office, two regional governments) is the superior choice. One major advantage is that it completely eliminates the unnecessary and delicate problem of deciding on the composition of and the membership of the group that would represent the two regional governments of the NF. A Lake Basin Office representing the overall Great Lakes view and two regional governments, each representing a national interest on a single frontier, appear to offer excellent possibilities for the realization of our objectives. The Lake Basin Office and the two regional governments would complement and reinforce each other. The greater financial resources and research capabilities of the former can be brought to bear only with public understanding and support engendered by the efforts of the regional governments. In turn, the two regional governments ensure

that the resources and programs of the Great Lakes organization are applied with the interests of all of the people of the Niagara Frontier in mind.

Application to Other Frontier Areas

This chapter began with a brief description of the three frontier areas of the Great Lakes and perhaps it is only fitting to conclude with them. It was pointed out that the frontiers have much in common, share common pool resources, have similar problems and all share the distinction of being the only connecting links between the United States and Canada along the entire length of the international Great Lakes. On two of these frontiers, Niagara and Detroit-Windsor, the environmental problems have become real and visible to citizens on both sides.

The Detroit-Windsor and Niagara Frontiers are similar as to urban concentrations and international problems and interests; the Saulte Ste. Marie Frontier is far less populated and less prominent. The Detroit-Windsor and Niagara Frontiers are indeed very much alike, although the environmental problems in the former are more severe. In fact, the Detroit River is the most severely polluted water body in the Great Lakes system and the condition of that river is a major factor in the accelerated eutrophication of Lake Erie. Air pollution in the frontier, like the Niagara, is among the most severe in each nation. Land development conflicts and land pollution are common in an international metropolitan area that currently contains in excess of 7 million persons.

We suggest that the approach to regional government outlined in this chapter for the NF has a high degree of transferability to the Detroit-Windsor Frontier. The ultimate success of the proposed Great Lakes organization concept will turn on the effectiveness of the interaction

that takes place at the lake basin level and particularly at the two principal international frontiers. The required interaction at the frontier level cannot take place under the circumstances as they now exist. The sine qua non is the substantial elimination of the highly fragmented local government structure found in both countries but more extensively so in the United States.

REFERENCES AND FOOTNOTES - CHAPTER XI

[1]Ontario Department of Treasury and Economics, Economic Analysis Branch, Ontario Population Projections for Counties and Districts, 1966-2001, Toronto, Ontario, 1970.

[2]Canadian Urban Economics Limited, Economic Base Research and Analysis, Report No. 5 (St. Catherines, Ontario, Regional Municipality of Niagara Official Plan Studies, December, 1971) pp. 3-15.

[3]International Joint Commission, Lake Erie-Ontario Advisory Board, The Niagara River - Pollution Abatement Progress, August 1971, p. 3.

[4]Ontario Department of Treasury and Economics, op. cit., note 1.

[5]Id.

[6]New York State Office of Planning Services, Demographic Projections for New York State Counties to 2020 A.D., Albany, New York, August 1969, p. 7.

[7]Erie and Niagara Counties Regional Planning Board, "Regional Land Use" ENCRPB Newsletter. Vol. 1, No. 2, (December 1969).

[8]New York State Office For Regional Development, Change/Challenge/Response, Albany, New York, 1964.

[9]Honourable W. Darcy McKeough, "The Regional Municipality of Lincoln and Welland," Address given at the Town of Niagara, January 23, 1969, p. 18.

[10]The Regional Municipality of Niagara, Illustration of the Increase In Grants Payable Under the Regional Government Act Over the Municipal Unconditional Grant In The Area Municipalities In The Region Of Niagara, St. Catherines, Ontario, April 1970, p. 4.

[11]Ontario Economic Council, Government Reform in Ontario, Toronto, Ontario, February, 1969, p. 4.

[12]W.H. Palmer, The Progress of the Regional Government Program in Ontario, Toronto, Ontario, October, 1970, p. 5.

[13]Brief of The City of St. Catherines On Regional Niagara Implementation presented by the Mayor and Members of the Council of the City of St. Catherines to the Ontario Municipal Board, March 22, 1971.

[14]New York State Division of the Budget, Office of Statistical Coordination, New York State Statistical Yearbook, 1971, Albany, New York, 1971, p. 178.

[15]Erie and Niagara Counties Regional Planning Board, Initial Environmental Study, Grand Island, N.Y., June 1970, p. 70.

[16]Erie and Niagara Counties Regional Planning Board, "International Design Study, "ENCRPB Newsletter," Vol. III, No. 5 & 6, (November-December, 1971).

[17]International Joint Commission, Lake Erie-Lake Ontario Advisory Board, The Niagara River-Pollution Abatement Progress-1971, (August, 1971), p. 25.

[18]U.S. Congress, Committee on Government Operations, House of Representatives, Hearings On Grant Consolidation and Intergovernmental Cooperation, Ninety-First Congress, (Washington, D.C., U.S. Government Printing Office, 1969), p. 178.

[19]New York State Division of the Budget, op. cit., note 14.

[20]Hearings on Grant Consolidation and Intergovernmental Cooperation, op. cit., note 18.

CHAPTER XII

POPULATION DISTRIBUTION*

Introduction

In the preceding chapters we have dealt mainly with the use and abuse of the natural resources of an international region. We have tried to show how the inadequacies of present institutional arrangements prevent effective management of these resources. In the context of the Great Lakes region, an "institutional lag" seems to be the heart of the problem. While it is indeed a most serious problem inasmuch as it stymies cooperative efforts in the Great Lakes region, in the broader view, the institutional problem is a dependent variable of a more basic problem of society and that is population growth and distribution. In the way of a definition, population distributions refers to the apparent random fashion in which people either concentrate or fail to concentrate across the national map. The shift of population from rural areas to urban centers is a demographic phenomenon that has been going on since the industrial revolution. In the United States, that migratory pattern was given added impetus after the Civil War when black people in large numbers began to move to northern states. While the shift from rural to urban centers has continued to the present, in more recent years there has been superimposed over it a tendency of people living in the northeast and interior states to migrate to the west coast and to the southern Gulf states. The effect is as if there were a kind of centrifugal force operating in such a way as to concentrate people in significant numbers on the edges of the national boundaries. The consequences of this trend in the long term for the nation's

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*This chapter is based on a paper by Lawrence W. Saunders entitled, Toward a National Population Redistribution Policy: Some Policy Issues, 1973.

coastal zone, which includes the Great Lakes, are obvious. By the year 2000, three of the Great Lakes will be nearly enveloped by a vast megalopolis stretching from Chicago to Montreal. Fifty years after that it can be anticipated that the U.S. shores of Lake Superior and Lake Huron will be included within that conurbation. The implications of this for the natural resources of the region are important. The challenges to any bilateral organization assigned the task of preventing complete chaos would be incessant and of ever-growing complexity.

The question is asked, must we stand by helplessly while these great agglomerations of people actually materialize? What is our record on devising and implementing public policies to achieve a more balanced and thus less environmentally threatening distribution of people? This chapter is devoted to a discussion of these issues. It is, to be sure, a very complex topic which is closely linked to the political, economic and social values of the nation. The treatment here is not complete and is intended merely to describe the problem, the efforts undertaken so far to manage the problem and, finally, some options that may be open to us in the years ahead in modulating population distribution.

Population Growth and Distribution

GROWTH[1]

In its relatively brief history, the United States had undergone an authentic demographic revolution. From independence up until 1900 the nation's population grew from about 1 million to about 76 million.[2] In the ensuing 70 years, it has grown to about 205 million,[3] an increase of 129 million persons.

FIGURE 8

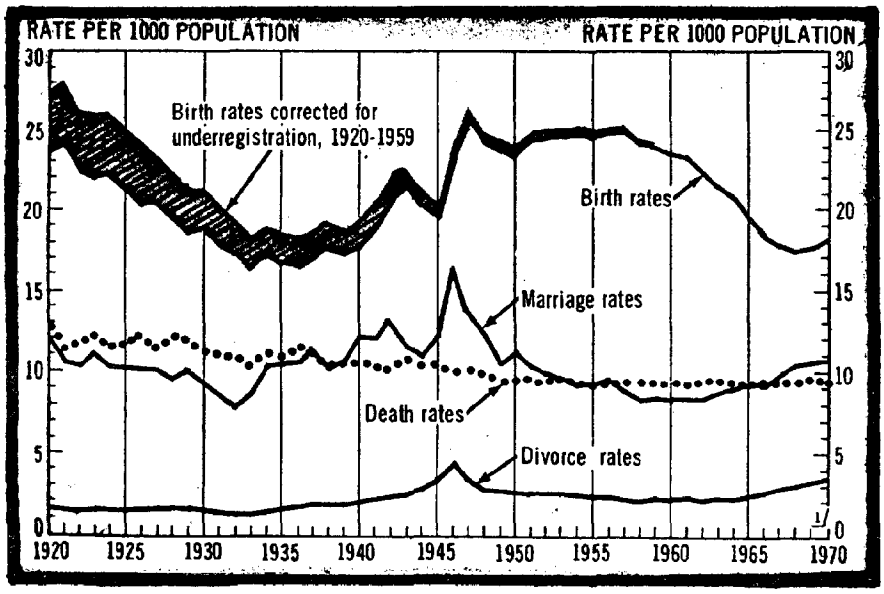
Demographic Perspective of 20th Century United States

	Around 1900	Around 1970
Population	76 million	205 million
Life expectancy	47 years	70 years
Median age	23 years	28 years
Births per 1000 population	32	18
Deaths per 1000 population	17	9
Immigrants per 1000 population	8	2
Annual growth	1¾ million	2¼ million
Growth rate	2.3 percent	1.1 percent

Source: The Commission on Population Growth and the American Future, Population Growth and the American Future

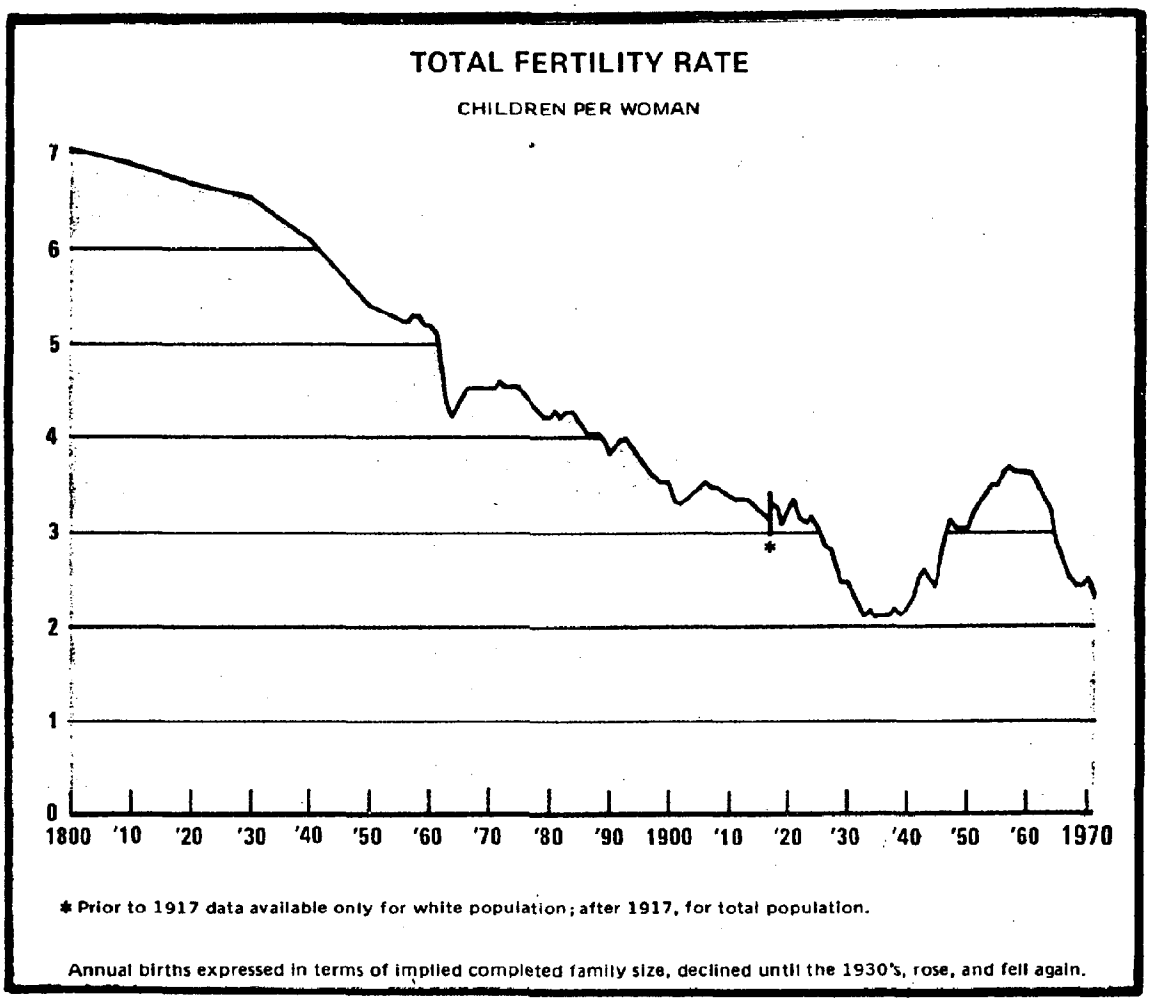
FIGURE 9

BIRTH, DEATH, MARRIAGE, AND DIVORCE RATES
1920-1970



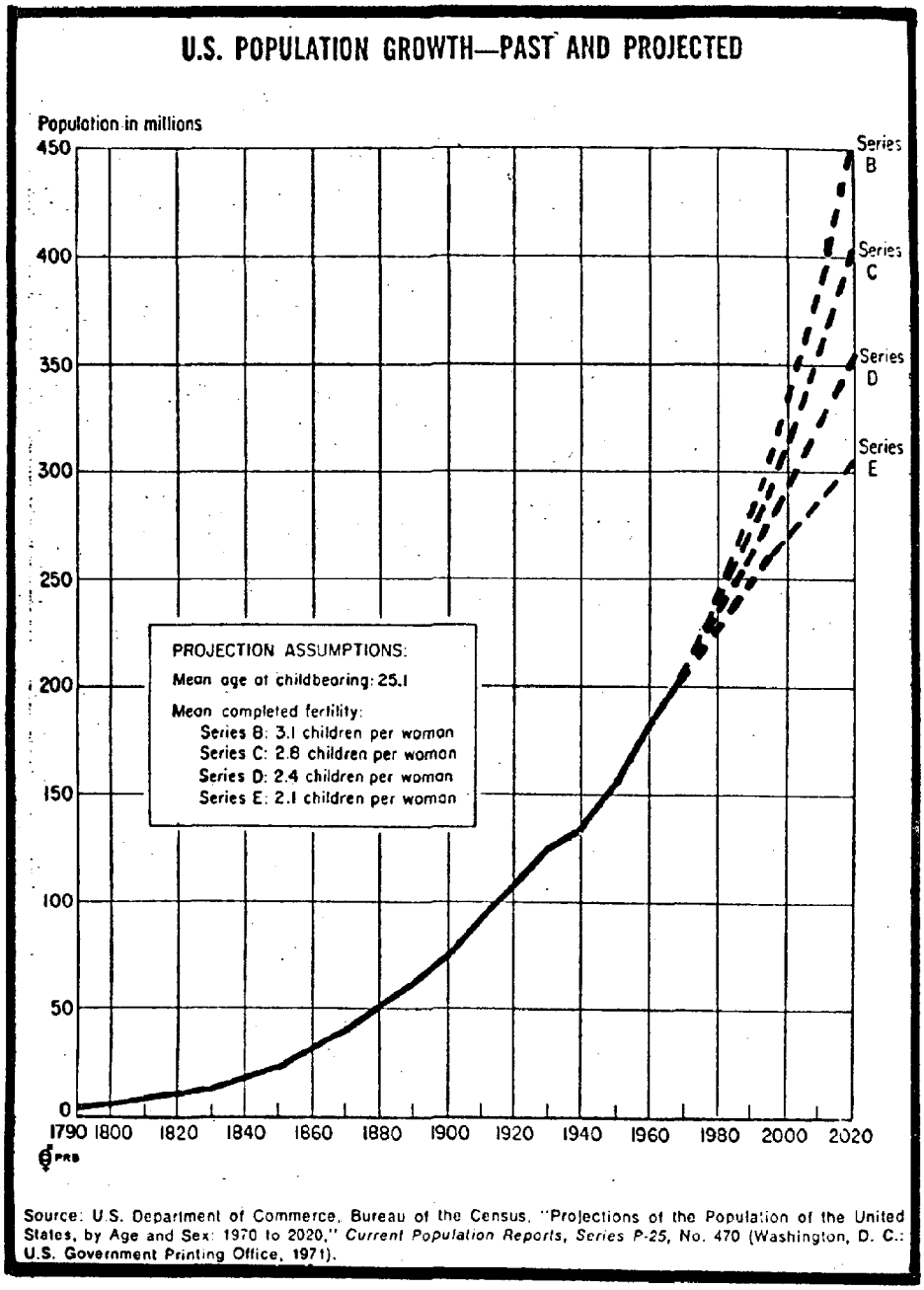
Source: U.S. Bureau of the Census, Statistical Abstract of the United States 1971. (92d edition.) Washington, D.C., 1971, Fig. IV, p. 47.

FIGURE 10



Source: The Commission on Population Growth and the American Future, op. cit., p.Galley 1-5.

FIGURE 11



Source: The Population Bulletin, op.cit., p. 3.

This growth is the result of significant changes in all three components of population growth, namely; fertility, mortality and migration (see Figure 8).

The first factor, fertility, or birthrate is a simple measure that indicates the average level of yearly births in the nation. There are, of course, more sophisticated measures by age groups, marital status, race, etc., but the measures used here are simply intended to give a broad perspective to population growth.

In 1910 the birth rate in the United States was 30 births per thousand population[4] and steadily declined through the depression years to about 18 births per 1000. This trend was reversed after World War II when birth-rates in the late forties and fifties increased sharply to a maximum of 27 births per 1000 population. In recent years the birth rate has again declined to about 18 births per 1000 population (see Figure 9).

The significance of the postwar increase is not over. It is like a compression wave of humanity that will push through all stages of the life cycle creating tremendous problems in its path such as primary, secondary and college education, jobs, housing, and retirement and then a void when they are gone.

The second determinative factor of the rate of growth in a nation is the death rage. The U.S. death rate has declined from about 17 per 1000 population in 1900 to 9 per 1000 in 1970; and the average life expectancy has increased by 23 years (47 to 70 years).

The change in mortality rates is attributed mainly to the reduction of infant mortality and these rates are presently so low for a large segment of the population that any future increases in the life expectancy of man will have to come by reducing the incidence of death from major diseases.

The third component of national growth is migration or in this case immigration. According to the Report of the Commission on Population Growth and the American Future (hereafter referred to as the 'Commission'), "Approximately 40 percent of the population growth in the first decade of this century was attributable to immigration."[5] There is little need to dwell on the obvious impact of this 40 percent over the last 60 or so years in terms of population growth. During the depression of the 1930's, however, more people left the United States than immigrated to it, but since World War II and during the 1960's immigration has accounted for about 16 percent of national growth.[6]

The net effect of the birth rate minus mortality rate plus immigration has been that the population growth rate for the nation has generally declined from 2.1 percent in the early 1900's to 0.7 percent in the 1930's to 1.9 percent in the 1950's to the present level of 1.1 percent.[7] Even though the rate of growth is now relatively low, the 205 million population base will add about 2.25 million people per year. During the next 30 years this means an increase in population of at least 70 million persons, but more likely 100 million persons.[8] What is more significant is the fact that even if the fertility rate was at the replacement level, that is 2.1 children per family,[9] the population would still increase by about 70 million as a result of the reaching of maturity of children born during the baby boom (see Figures 10&11).

However, given the child-producing potential of the postwar babies, one would expect the rate of births to rise and, in fact, they did from 1968 to 1970 from 17.5 to 18.2 per thousand. But in 1971 something happened, the birth rate dropped to 17.3 per thousand, contrary to the expectations of most experts.[10] What caused the decline? Basically there are two

factors, the first relates to young couples delaying having a family in order to complete their education or to achieve financial security prior to beginning a family. This is evidenced somewhat by the rise in the average age of child bearing. The second factor, which is significant, is that younger couples expect to have smaller families. A study by the Bureau of Census used by the Commission of women 18 to 24, indicates that women in this age group expect to have an average of 2.4 children before they complete their families.[11]

POPULATION DISTRIBUTION - URBAN

During the last 70 years we have witnessed the evolution of the U.S. economy from agrarian to manufacturing to a service orientation. In this process the nation has been transformed into an urban society. According to the Bureau of the Census almost 70 percent of the 1970 population was classified as metropolitan and by the year 2000 this proportion is expected to rise to 85 percent.[12] This metropolitanization is the result of substantial increases in productivity in the agricultural sector and the dominance of commercial, professional and industrial activities that thrive where people, equipment, money and skills are concentrated.

According to the Report of the Commission on Population Growth and the American Future, metropolitanization consists of concentration at the national level and dispersion at the local level.

On the national level, population is concentrating in three large metropolitan belts; Boston to Richmond, Chicago to Pittsburg and San Francisco to San Diego. These three belts contain over 50 percent of the nation's population with an overwhelming proportion of the most technologically advanced, prosperous, and creative elements of society.[13]

On the local level, there is the diffusion of people from the central cities to the surrounding suburban areas. This suburbanization has resulted in a continuous decline in the total population densities of major urban centers since 1920. A study by demographer Pickard (1967) showed that metropolitan areas of 100,000 population or more had densities in 1920, 1940 and 1960 of 6580, 5870 and 4230 persons per square mile, respectively. These densities are expected to decline further to 3840 and 3732 persons per square mile in 1980 and 2000, respectively.[14]

With almost 70 percent of the population concentrated in metropolitan areas, it is only natural to expect that a substantial portion of the nation's future growth will be in these areas. Adding further to the national concentration of people is the natural increase in population which is now the dominant source of metropolitan growth since the large migrations to metropolitan areas have already taken place.

Migration is basically both a response to and a physical manifestation of changing personal preferences, circumstances and opportunities. It has generally meant bettering oneself socially and economically. But population movements produce social, economic and political realignment for the nation as well as personal adjustments. According to the Commission, "migration helps achieve a balance between social and economic activities on one hand, and population numbers on the other."[15] This balance, so to speak, is brought about by three types of movement. The first, is a movement from economically depressed regions, often rural, to areas of expanding employment opportunities and higher wages, usually metropolitan; second, the movement of people within metropolitan areas, for example, the movement of the population from the central cities to the suburbs; and third, the migratory flow between metropolitan areas by which individuals participate in a national job market moving to areas offering economic and sometimes environmental advantages.

About one in five persons change homes each year and one in 13 moves over county lines;[16] this means that about 40 million people move each year among which 13 million move across county lines.

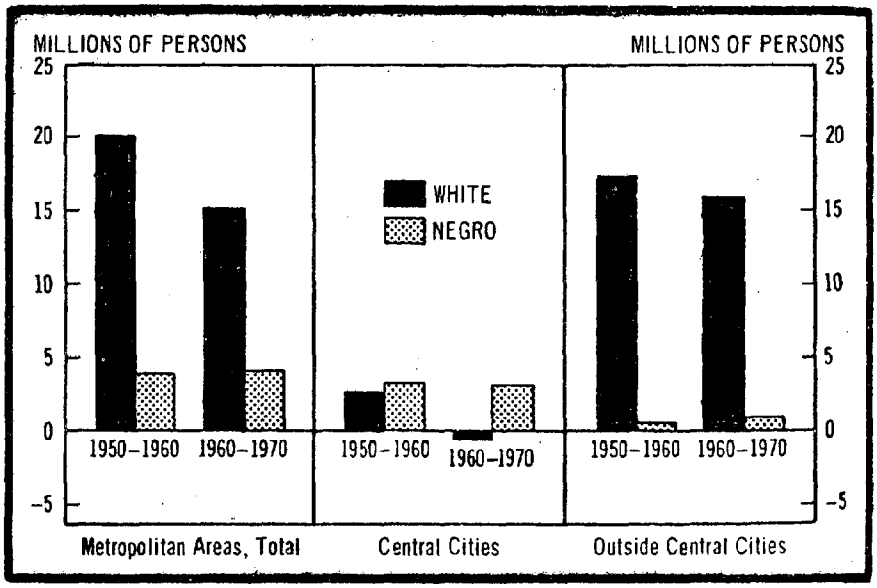
The urbanization of America has brought with it tremendous social and environmental costs. This country owes its overall prosperity to the metropolitan areas. The job opportunities, the capital structure, the social structure, the money, the markets and the skills of the population have all contributed to our general well-being. However, the distribution of this prosperity among members of the metropolitan society has been far from equitable.

The plight of our central cities is obvious. Like many of our rural areas, our central cities are losing population. The growth cited earlier is occurring in suburban portions of metropolitan areas and future national growth is virtually synonymous with suburban growth. The white middle income class of the population continues to leave the central city areas. With this migration they are drawing industrial and commercial development from the central cities, thus aggravating the problem even further. Fifteen of the 21 central cities with a 1960 population of over 500,000 or more had lost population by 1970.[17]

Suburbanization has further segregated the white population from the black and other minority groups (see Figure 12). This residential segretation is due partly to these minorities being unable to afford the cost of housing in suburban America, and partly to outright discriminatory practices by realtor organizations and home mortgage lenders. With the movement of industry to these suburbs, job opportunities for the population left behind in the central cities decline.

FIGURE 12

POPULATION CHANGES IN METROPOLITAN AREAS, BY RACE: 1950-1960 and 1960-1970



Source: U.S. Bureau of the Census, op.cit., Figure III, p.4.

The result is a concentration of the black population and other minorities in central city areas, entrenching the already established pattern of racial separation. In 1970, only 41 percent of the white population classified as metropolitan lived in central cities while 78 percent of the black population lived in central cities.[18] In 1970, six of the 21 central cities had a population that was over 50 percent black and this number is expected to increase in the next decade.[19]

Central city governments are faced with a declining tax base and the ever increasing burden of welfare, health and other assistance to a community of tax users as opposed to taxpayers.

Presently about 12 percent of our population live in poverty conditions. This represents 24 million people. (see Table 12) Over 6 million are employed but cannot earn enough to meet the minimum income standard. Over 3 million of the poor (age 14-64) cannot work because of school, sickness, disability. Another 5 million are over the age 65 and over 8 million are children and about 2 million are female heads of families who cannot or do not take a job because of family responsibility.[20] Average incomes of the poor have improved as have those of higher income groups, but inflation has reduced the real incomes of both. The result is simply that the distribution of personal income has remained relatively constant over the past 25 years.[21]

The prospects for the future do not appear to be better. The postwar babies previously mentioned are now entering the job market. Job competition will become stiffer and more and more marginal employees will be released to make way for more productive persons. Unless appropriate measures are taken, unemployment could rise substantially.

About 35 million new jobs will be needed in the 70's,[22] about 7 million more than the 60's. With the current trend in declining fertility, the pressure for jobs will be eased somewhat in the 80's, however, what happens in the 70's in terms of fertility will greatly influence what happens to the labor market in the 90's and beyond.

Despite the so called social infrastructure of metropolitan areas, many individuals are dissatisfied with the urban life style. This discontent manifests itself in the urban population seeking the space and security found in non-urban areas. Suburbia offers a convenient compromise between city life and rural life, permitting some to have the best of two worlds.

POPULATION DISTRIBUTION - RURAL

In 1900 rural population in the United States was 46 million or 60 percent of the United States population. In 1970, rural population was 54 million while the national population had increased nearly 300 percent and in 1970 rural population was only 26 percent of the total population. The farm sector of the rural population has declined from about 40 million in 1900 to about 10 million in 1970.[23]

During this period, out migration of the farm population averaged about 2 percent per year. Although the rate has remained high, the actual number of out migrants has declined from about 1 million per year in the fifties to about 600,000 per year during the sixties (see Figure 13) This is due primarily to a constantly decreasing farm

TABLE 12

Persons by Poverty Status, by Type of Residence, 1969

Persons by poverty status, by type of residence, 1969

[Number of persons in thousands]

Residence type	All races			White			Negro		
		Below poverty level			Below poverty level			Below poverty level	
	Total	Number	Percent of total	Total	Number	Percent of total	Total	Number	Percent of total
United States	199, 849	24, 289	12. 2	175, 231	16, 668	9. 5	22, 349	7, 214	32. 3
Metropolitan	130, 017	12, 320	9. 5	112, 440	8, 200	7. 3	15, 824	3, 855	24. 4
Central city	57, 781	7, 760	13. 4	44, 392	4, 527	10. 2	12, 439	3, 068	24. 7
Metro ring	72, 236	4, 560	6. 3	68, 049	3, 674	5. 4	3, 384	786	23. 2
Nonmetropolitan	69, 831	11, 969	17. 1	62, 791	8, 468	13. 5	6, 525	3, 359	51. 5

Source: Bureau of the Census, Current Population Reports, "Consumer Income," P-60, No. 76, table 3.

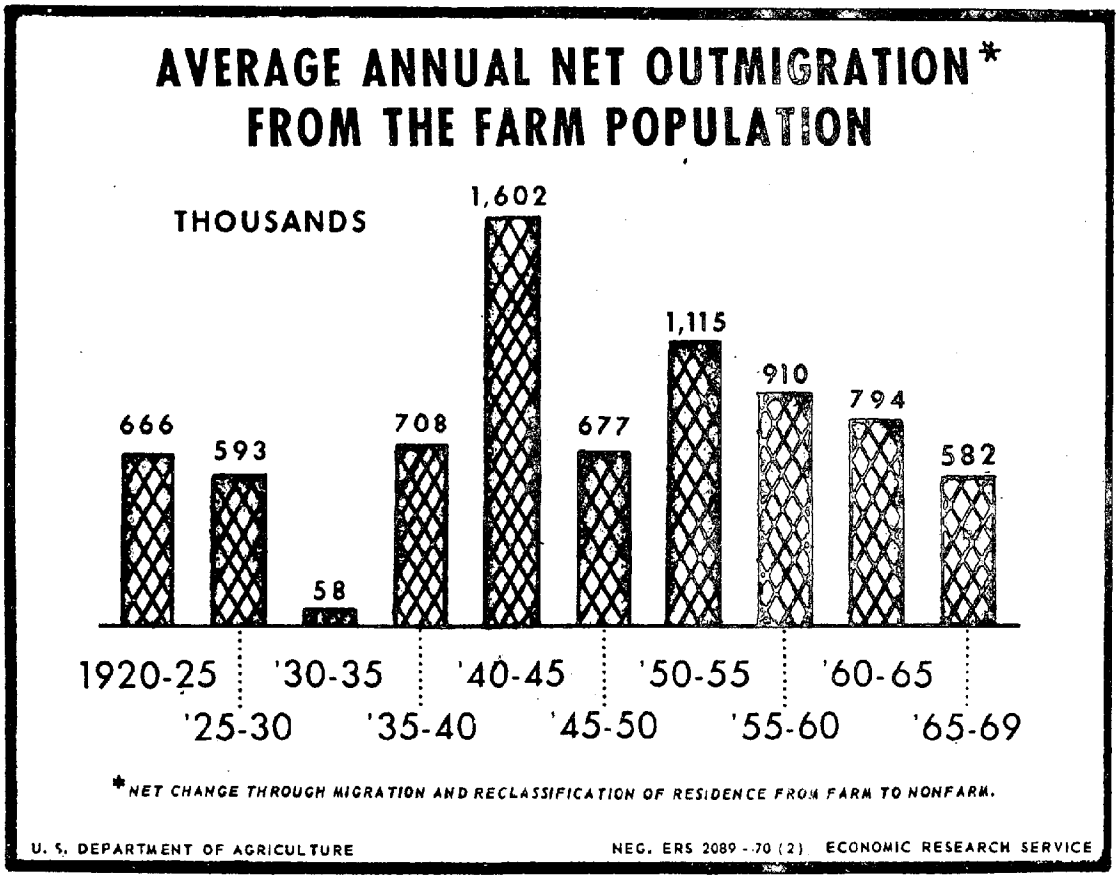
Source: U.S. Department of Agriculture, Part 1, op.cit., p. 19.

population base. Because fewer people are involved, the impact on both rural and metropolitan areas has lessened. With fewer than 10 million people left in the farm sector, the prospect for further large scale migration from farms is greatly diminished.

The characteristics and composition of these migrants from the farm sector and total rural area can be generally categorized into two groups.

Early in this century the migration was almost totally composed of the white population. These migrants were sons and daughters of early immigrants who had settled on farms or in rural areas, such as people from Appalachia, the Ozarks and other economically depressed rural areas. In recent years, the migrants have been predominantly the rural black population. This movement was from the rural south to the metropolitan north, east and west. From the foregoing discussion one might get the impression that our migration problem is behind us, however, a look at 1970 census data indicates that almost half of the nation's counties lost population during the preceding decade. A majority of these counties are the rural areas of the nation and cities of less than 50,000 population. While the migration from farm areas represents a far less significant problem than in previous years, the rural population, which is about 30 percent of the total population, still poses a threat of large-scale migration to the urban centers. If, for example, we could somehow re-populate rural communities to their historical maximum, these areas would absorb only 10 percent of the population growth projected for the nation in the next 30 years.

FIGURE 13



Source: U.S. Department of Agriculture, Part 1, op.cit., p. 7.

It was just stated that over 50 percent of the nation's rural counties declined in population in the last decennial census. This decline is the net effect of both out-migration and the natural increase in population (from a declining base). The continuing technological revolution in agriculture has displaced millions of workers without providing them with alternative employment opportunities to remain in the rural areas. The movement of this population (primarily blacks since 1940), coupled with the natural increases, has created serious problems for both rural and urban America.

Generally, rural areas suffer from inadequate health, education and manpower training programs, insufficient job opportunities and low quality housing. The young and ambitious have moved out of these areas reducing the human resource base of rural areas. With reduced manpower and tax bases, rural communities and smaller cities find it increasingly difficult to provide the remaining population with an adequate community infrastructure.

Existing Federal Policies and Programs

Throughout the history of the United States, the Federal Government has had a substantial influence on population growth and distribution. This influence included policies on virtually unlimited immigration into the country and the settlement of the west in order to confirm the nation's title to an empty continent. The Federal Government provided land grants and other subsidies for the development of roads, railroads and navigation that opened public lands to settlement. At the turn of the century, the government pursued policies of reclamation, navigation,

electric power projects and rural development programs. In recent years, we have had TVA and the ARA and the Economic Development Act of 1965. All of these policies are explicitly involved with the growth, distribution, and the economic and social well-being of the population. Perhaps even more important have been the implicit policies of the Federal Government that were not expressly directed toward affecting population growth and distribution.

HOUSING AND URBAN DEVELOPMENT

Aside from the deliberate policies mentioned above, no express policy that directly affected population growth and distribution was promulgated until the early 1960's. However, during the 1930's, there began to grow an awareness of some problems in urban America. The New Deal legislation of the 30's was concerned directly or indirectly with ways to provide jobs and solve the economic problems of the nation. There were, however, two pieces of legislation that were destined to have a significant impact on the future of urban America. In 1932, the Federal Government established the Home Loan Bank System, (HLBS) which was modeled after the Federal Reserve System and would act to control savings and loan associations. In 1934, the Federal Government set up the Federal Housing Administration (FHA) an agency that would insure loans on homes to savings and loan associations, commercial banks, and insurance companies. The two agencies in some ways were competitive, primarily in both of their relationships with savings and loan associations and as the representatives

of different financial institutions competing for home loan business. The programs, as established, favored the middle class family and provided it with the means to purchase a single family dwelling.[24] Thus, sub-urbanization began but the full impact of this course would not be recognized for many years. Minor efforts were made to develop low cost housing for the poor but the programs were ineffective both in scope and in results. It was in this period that the nation failed to learn how to build low cost housing for the poor. The situation has not seen much improvement, notwithstanding the passage of forty years.

In 1935, the National Resources Planning Board (NRPB) began issuing a series of reports on the condition of urban America. These reports, Regional Factors in National Planning (1935), Our Cities (1937), and Urban Planning and Land Policies (1939), were concerned with identifying national trends and did not reveal any significant changes in urban development that warranted any policy or program changes.

World War II precluded any Federal legislation designed to meet the nation's needs in the way of construction of new housing, the rehabilitation of existing housing or the improvement of mortgage credit for either. No significant action was taken by the Congress until the 1949 Housing Act was passed.[25] The Act, although a step in the right direction, was not as comprehensive as some would have liked. There was considerable public interest in housing because of the postwar shortage, but there was also considerable political opposition to public low-income type housing and urban and rural redevelopment proposals. Compromises were worked out and the Act contained some modest measures for public housing and urban

renewal. The Act was really quite limited in scope and purpose. For example, it ignored employment, education, transportation, and welfare considerations with the result being that the middle income class reaped the benefits. In the two decades that followed, the nation experienced the mass exodus from central cities to suburbia. Low down payments, and low interest rates made it relatively simple for the employed white middle class to move into single-family units in the suburbs. The blacks and other minority groups did improve somewhat their own living conditions, moving into homes vacated by the whites and the eradication of many slum areas under urban renewal programs.

The situation as it stands now was well-expressed by Dr. Lowdon Wingo when he referred to the overall effects of both the housing and highway programs:

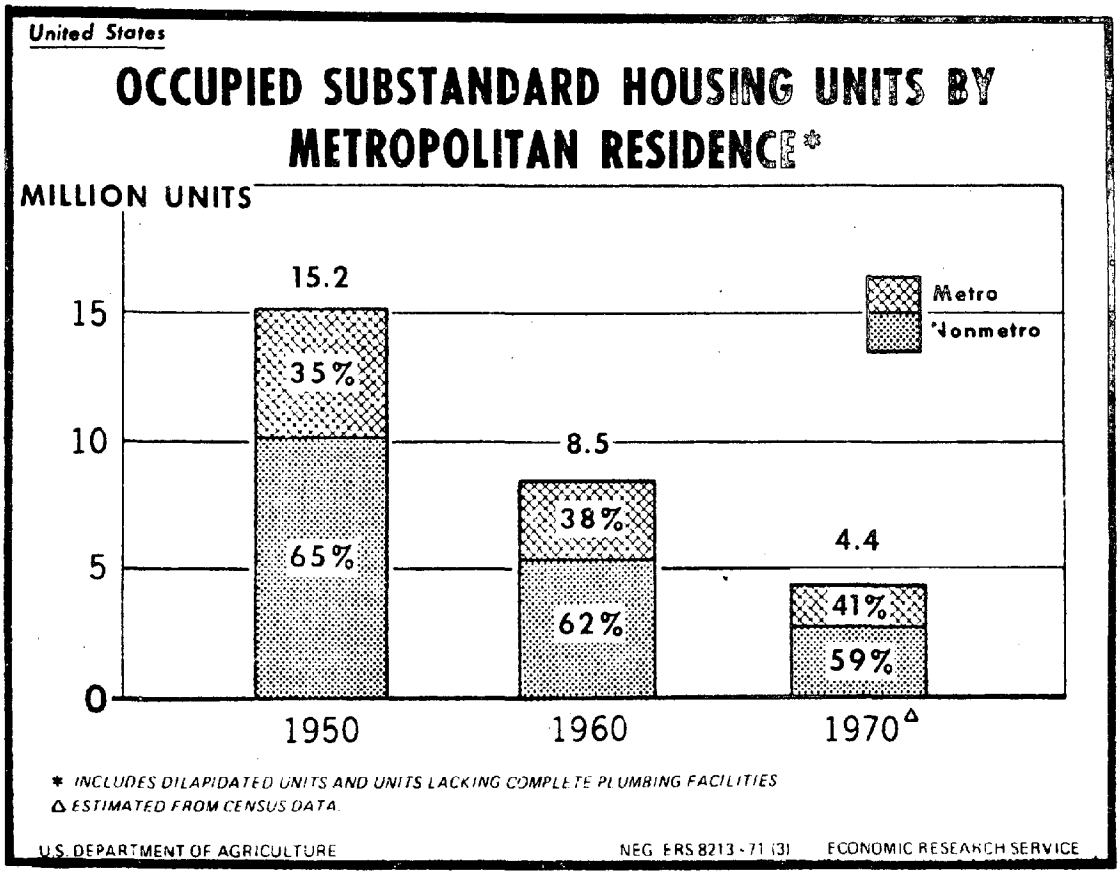
> "(these programs)...opened up enormous land development reserve in the hinterlands of every major city and...made an American ideal of the free standing, single family dwelling on its own parcel of ground, and the stage is set for the low density suburban explosion, which has been a major outcome of American policy. The other side of the coin is, of course, the residual community which the suburbanizing middle class left behind, the excluded minorities, the poor, the old. They were left behind because it cost money to join the suburban 'club' - to move, to pay rents for new housing produced by an industry which never learned to produce low cost housing, to pay taxes, to pay transportation costs to jobs and public services. Thus, the built-in exclusionary principle embedded in these policies acted like a filter sorting out the affluent from the poor, and where these implicit processes were not sufficiently fine-grained, the federal system made possible finer screens, home-rule communities surrounding the central city had only to enact ordinances whose affect if not explicit purpose was to exclude."[26]

But what about housing in rural America? While HUD administered numerous housing programs in urban areas, a few of these programs spilled

over into rural areas and were somewhat duplicated by Agriculture Department programs. Despite the departmental overlap, the programs have been, by and large, unsuccessful in relieving the unsatisfactory housing conditions of rural America. Keeping in mind that the rural and non-metropolitan populations consitute only 30 percent of the total population in the nation, census data show that about 27 percent of occupied rural housing was classified as substandard (deteriorating or dilapidated) compared with 14 percent for urban areas.[27] Of the 4.4 million substandard occupied housing units in the nation, 2.6 million were in rural areas.[28] (see Figure 14) More than 1 million rural homes are considered structurally unsafe for human occupation with many beyond repair. Less than half of all rural homes have central heating, most are heated by gas, wood, or coal burning stoves with the ever present danger of fire. A disproportionate number of the elderly occupy substandard housing in rural areas and renters were twice as likely to occupy substandard housing. Finally, most of the substandard housing is found in the south which might be expected when one considers that this region has the lowest per capita income, family income and largest families in the nation. There is no doubt that the rural poverty problem is sectional, but it cannot be considered as concentrated pockets of poverty. Rural and urban poverty know no boundaries and are found in all sections of the country.

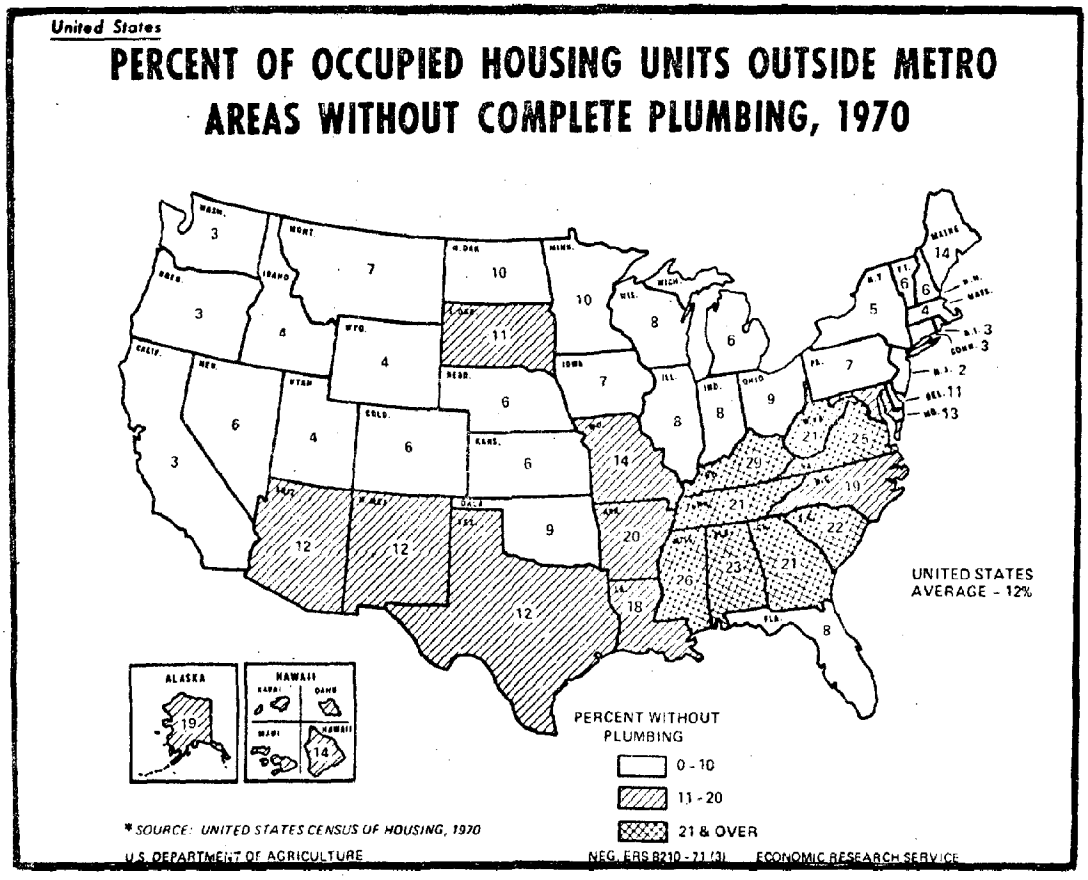
A recent study by Dr. Fred Hines for the Department of Agriculture shows that per capita federal outlays for housing in the rural areas were only half as large as in metropolitan counties. While non-metropolitan counties accounted for about two-thirds of all substandard housing in 1968, they received only 16 percent of all housing assistance.[29]

FIGURE 14



Source: U.S. Department of Agriculture, Reference 16 at 109

FIGURE 15



Source: U.S. Department of Agriculture, Reference 16 at 111.

The Urban Growth and New Community Development Act of 1970 affirms for the first time on the part of the Congress its commitment to a national urban growth policy.[30] The Act directs the President to submit to Congress reports on urban growth, urban problems, urban needs, governmental policies at all levels and plans and programs to resolve these problems. The Act further provides assistance to state and local developers and planning agencies in order to develop comprehensive plans of the orderly development or redevelopment of urban areas.

Title IX of the Agricultural Act of 1970 again shows a Congressional commitment toward a national policy on the growth and distribution of the population. Section 901 (a) of this Act states:

> "The Congress commits itself to a sound balance between rural and urban America. The Congress considers this balance so essential to the peace, prosperity and welfare of all our citizens that the highest priority must be given to the revitalization and development of rural areas."[31]

AGRICULTURAL POLICIES AND PROGRAMS

With the development of a capital intensive and highly productive farm sector supported by subsidy programs and heavy government investments in agricultural technology and research, we have witnessed the departure of about 50 million persons from rural areas to the urban centers and the suburbs.[32]

Some of our rural programs, especially farm and vocational agricultural programs, are relics of an earlier era. They were developed in a period during which the welfare of farm families was equated with the well-being of rural communities and of all rural people. This is no longer so. Many

of these programs still remain even though farm output has increased in the last 20 years over 50 percent while farm employment has dropped at lease 45 percent.

Today's Federal farm policy is dominated by acreage control and price support programs. Well over two-thirds of the Federal cost of assistance to farmers, including export subsidies, is associated with efforts to balance supplies and demands for individual farm commodities. The price support program clearly benefits the higher income farmers rather than the small farmers. A USDA study showed that in 1966 farmers with annual gross sales of $30,000 or more received net incomes averaging 129 percent of what a comparable amount of labor and capital would earn in non-farm activities. On the other hand, farmers with less than $5,000 in value of sales received net incomes averaging only 31 percent of what comparable resources would have earned in non-farm activities. It would have been necessary to triple the prices of farm products to increase the returns on these small farms to levels that compared favorably with returns for comparable resources in non-farm uses.[33]

HEALTH, EDUCATION AND WELFARE POLICIES AND PROGRAMS

HEW has over 60 programs that are designed to provide for the health, education and welfare of the poor and are directed toward aiding states, local governments and school districts in these fields. Thirty-three of the programs are directed toward all levels of education and it appears that this aid is equitably distributed between rural and urban

areas with a few exceptions to be noted. It is difficult to determine, however, how equitable educational outlays are on a per capita basis because of differences in state aid to school districts and the basic taxing authority of individual school districts.

Federal outlays for educational aid under the 1965 Education Act are disproportionate between rural and urban counties. Title I of this Act was to provide educational aid for the elementary and secondary education of disadvantaged children in low-income areas. In a study by Hines (1971) it was shown that an equitable distribution of this aid would be in proportion to school age children living in poverty in both rural and urban areas.[34] However, this is not the way aid was distributed, with about half of school age children and poverty families located in the rural areas they received just over 40 percent of total Federal outlays for this program. They received only 36 percent of the aid for the Headstart and Headstart Follow Through Programs.

A similar situation exists with respect to welfare and health assistance. Keeping in mind that half of the nation's children living in poverty are located in rural areas, their families received 24 percent of the aid to families with dependent children and only 20 percent of Child Welfare Services funds. On a per capita basis, Federal welfare payments were about 4 times greater in metropolitan areas than in rural areas. Similarly, per capita outlays for health services were over four times greater for metropolitan areas than for rural areas.[35]

It appears that the country has somehow lost sight of original good intentions to the point where metropolitan areas receive preferential treatment at the expense of rural areas. The significance of this with respect to population growth and distribution is difficult to determine, but we can be sure that these inequalities have contributed to rural migration and thus not so indirectly to the plight of our central cities.

Presently there are a number of bills pending that are intended to revamp existing welfare and health programs.

TRANSPORTATION POLICIES AND PROGRAMS

The Federal Government also has a long history of promoting transportation systems. Numerous programs have been undertaken to provide assistance for the development of railroads, navigation facilities, air transport, and highway systems. In the 1800's and early 1900's these programs made significant contributions to the settlement of the west.

During the late forties and early fifties, suburbanization was well under way around the nation's central cities and an adequate interstate highway system connecting these large commercial and industrial market centers was considered a high priority national need. Invoking "national security" as a complementary rationale for committing the Federal Government to an ultimate expenditure of $40 billion, the Congress, aided and abetted by the executive branch, not to mention the highway lobby, passed the Defense Highway Act of 1941. This program became a catalyst for the major suburban housing boom of the 1960's that still

continues unabated. Under this program, the Federal Government financed 90 percent of interstate highway construction. Although it was apparent from the very beginning of the program, building a highway system of the scope envisioned by the planners would inevitably bring with it a tremendous expansion of both housing and commerce. This aspect was not given much publicity by the promoters of the interstate system. The program was originally sold as a means of meeting the transportation needs of the major urban centers in times of peace and war. The result was that this system was constructed and continues to be constructed with almost a total lack of planning. Once the lines were drawn on a map between major centers, the details of how these lines would join the centers were left almost entirely to the highway builders. They, in turn and quite naturally, built highways where they could and where it was cheapest. There were no environmental concerns that had to be taken into account. As a result, small communities were isolated and even the centers, for which the system was designed, were left in relative isolation. In general, these highways came last to central cities and in some cases not at all.

The same situation is true of major international airport development. One need only to look at the residential, commercial, and industrial development that has taken place around new major airport complexes. As an example, we can take the case of the Dallas-Fort Worth Regional Airport. Five years ago, land in Coppel, Texas, a tiny town between Dallas and Fort Worth, was selling for about $1000 an acre. Today it is worth $10,000 per acre. In nearby Irving, a prime site

sold for about $5000 an acre three years ago and was recently appraised at more than $50,000 an acre. Some of the new developments attracted by the airport include a 6,500 acre new town, a $125 million office complex, a 716 acre commercial and residential development, and a covered shopping mall. Under the most conservative assumptions this area will become a home for over 52,000 people. The transportation system in this area will be overtaxed because about 200,000 cars are expected to visit the airport daily.[36]

AREA AND REGIONAL DEVELOPMENT PROGRAMS[37]

It was nearly 20 years after the close of World War II before any meaningful legislative action was taken to help economically depressed areas. Prior to this legislation there was only minor interest in the problems of depressed areas. As a result of the first postwar recession, the Congress passed the Employment Act of 1946 which granted the Federal Government certain powers to promote continued economic growth and full employment. Following this legislation, unemployment persisted and another bill, the Economic Expansion Act of 1949, was passed. This Act was designed to retrain and relocate unemployed workers and to promote preferential policies and other assistance to economically depressed areas. With the economic recovery of 1950 (Korean War) and continuing through to 1955, little interest could be stimulated in the Congress or in the administration for aid to economically depressed areas. The general feeling of the President's Council of Economic Advisors was that specific areas of chronic unemployment were local problems and should be handled by local and state governments.

TABLE 13

Unemployment Rates of Persons

Over 16 Years, by Major Industry Group

1950-1970

Unemployment rates of persons 16 years and over, by major industry group: annual averages, 1950–70 (experienced wage and salary workers)

Year	Total	Agricultural	Nonagricultural
1950	6.0	9.0	3.9
1952	3.3	4.8	3.6
1954	7.0	8.9	6.7
1956	4.4	7.3	4.7
1958	7.3	10.3	7.9
1960	5.7	8.3	6.2
1962	5.6	7.5	6.1
1964	5.0	9.7	5.4
1966	3.5	6.6	3.8
1968	3.4	6.3	3.0
1970	4.8	7.5	5.2

Source: Manpower Report of the President, April 1971, table A-16, p. 223.

Source: U.S. Department of Agriculture, Reference 40 at 69.

TABLE 14

Median income for males 25 to 54 years of age, by years of school completed, 1968 and 1969

[1968 dollars]

Educational attainment	Metropolitan areas		Nonmetropolitan areas		Median nonmetro income as percent of metro median	
	1968	1959	1968	1959	1968	1959
	Dollars	*Dollars*	*Dollars*	*Dollars*	*Percent*	*Percent*
Elementary:						
8 years or less	6,094	5,177	4,803	3,512	79	68
High school:						
1 to 3 years	7,303	6,115	6,248	5,201	86	85
4 years	8,350	6,793	7,297	5,716	87	84
College:						
1 year or more	10,363	8,339	8,804	7,301	85	88
4 years or more	11,395	9,251	9,740	7,915	85	86

Source: Current Population Reports, Special Studies, "Trends in Social and Economic Conditions in Metropolitan and Nonmetropolitan Areas," Series P-23, No. 33, Sept. 3, 1970, Bureau of the Census, table 39, p. 43.

Source: U.S. Department of Agriculture, Reference 16 at 99.

In the late fifties, the Congress made several attempts (which were opposed by the Administration) to pass legislation providing aid to depressed areas with chronic unemployment rates and low levels of income. Known as the Douglas Bill, the proposed legislation was to provide the basic infrastructure and public services of depressed areas, the expansion of unemployment insurance, and job training programs. The bill was passed by the Congress in 1957 but was vetoed by the President. The bill was reintroduced in the next Congress, passed and again vetoed. The primary objections to the bill were: 100 percent grants for public facilities, "loose" eligibility criteria, assistance to rural areas, lack of local participation for industrial and commercial loans, and the assignment of the program to the Housing and Home Finance Agency instead of to the more conservative Department of Commerce.

The new agency was virtually doomed to begin with. There were limited funds for inexpensive business loans ($175 million) and limited funds for the construction of public facilities ($175 million).[38] There were also problems of getting an experienced staff, coordination with other agencies, defining a workable program, developing techniques for economic background studies, and finally, an effective research and information system. As initially envisioned, the agency was supposed to benefit about 69 surplus labor and small industrial areas. However, this number was expanded eventually to about 1000 communities with stagnating economies. The effect was that the agency's funds were spread too thin across the nation to be effective.

The Appalachia area received some funds for economic development and funds for the development of an Overall Economic Development Program that described the areas major activities, trends, opportunities and problems. The basic idea was to identify communities and resources that would attract industry. It became apparent after about two years of operation that ARA could not help the Appalachia area with its problems to the degree necessary to stimulate redevelopment. This fact, coupled with the Appalachian floods of 1963, stimulated action by the White House. In April 1963, the President established the President's Appalachian Regional Commission (PARC) to study the problems and prepare a plan of action for the region.[39]

Even though the ARA had many problems, its main goals were of interest to the Johnson Administration. So rather than eliminating the program, it was modified with the passage of the Public Works and Economic Development Act of 1965. This Act doubled the appropriations for the agency, more than doubled its staff and the agency (ARA) was renamed the Economic Development Administration (EDA). In addition, the Appalachia Regional Development Act of 1965 put the PARC under the administration of EDA.[40]

The Act established larger districts and regions and reduced the total number of areas designated as economically depressed. Under this Act there were three levels of planning units, the most significant of which was the Economic Development District (EDD). These were multi-county units containing at least two depressed areas and an urban center

of less than 250,000 people. The idea was to stimulate growth of these urban centers in such a way as to benefit the whole district.

EDA's functions were primarily aimed at economically depressed areas with little or no emphasis on the problems of central cities although their problems were quite similar. What was the impact of ARA and EDA in handling the problems in depressed regions? The study by Lloyd Rodwin indicates that EDA learned that little could be accomplished on the county level and that larger planning regions such as the Economic Development Districts (EDD) were most effective. However, within these regions a coordinated regional program of development and development expenditures was needed. Separate and unrelated projects simply did not work and jobs could not be brought to every village and hamlet in the United States. Further, the study shows that 182 jobs were created for every million dollars invested. It was also shown that those who received the jobs were not the "target" group of the disadvantaged population as had been intended by the program. The average impact of job training and job creation because of the scale of these programs was trivial.

According to Rodwin, the most serious problem was the inability of EDA to extend aid to metropolitan areas, because according to the definition of redevelopment area, unemployment had to exist throughout a city or county. In many of our metropolitan regions, the high unemployment of the ghettos in central cities is offset by high employment rates in the surrounding suburbanized areas. It appears then that

the basic ideas and strategies of EDA are fairly sound, but stronger control, coordination and concentration of programs are needed.

GENERAL COMMENTS

All of these different Federal programs are concerned with the problems of urban congestion, the locational mismatch of jobs and people, and the linkages between urban and rural problems and urban sprawl. The solutions center around industrial location, population mobility, community development, human resource development and the planning roles of Federal, state and local governments.

The Congress and the executive branch have acknowledged the need for an overall national policy and strategy, but to date the recommended solutions have not yet been translated into such a policy.

Moreover, there is a feeling in some quarters that the Federal Government should not make a formal statement of policy regarding population growth and distribution until significant questions regarding such a policy are answered.

Among the proponents of this view is Dr. Lowdon Wingo, who raises some interesting questions regarding such a policy. His contention is that if the existing system is so stable that no available social interventions can substantially alter it, an urban (or rural) growth and distribution policy is academic. What is needed are studies that would show that governmental intervention would have a positive effect. Wingo cites six major, but not exclusive, areas of research that are needed.[41]

These are:

1. The general analytics of optimum city size.
2. The private costs and benefits as a function of city size and economic composition.
3. The negative and positive externalities as a function of city size and economic composition (and vice versa).
4. The distribution of city sizes in a national system as a function of the composition of the national economy, technology, incomes, consumer preferences and transport costs.
5. The current and capital costs of producing and distributing overhead services as a function of city size.

No one can say that Dr. Wingo is wrong in identifying the areas of research needed and it is important that we continue our research. In the interim, however, the nation should move cautiously but with flexibility into an area that needs immediate attention. Congress has stated that the population growth and distribution problem in both urban and rural America must be given the highest priority.

The Tools of a National Program

We have briefly described past and present population growth and migratory trends and have also examined various broad categories of Federal Government programs and how they have contributed to the distribution pattern. Although not explicitly stated but certainly implied is a general lack of planning and action at state and local levels of

government in dealing with population distribution problems within their respective jurisdictions.

This section and the final section outline a framework for a national program that would modulate the distribution of people to help achieve the social and economic goals stressed in this chapter as well as the environmental goals identified (in the specific case of the Great Lakes region) in other chapters of this book. Four basic concepts that we have selected as the building blocks of a national population distribution strategy are discussed. This particular selection is, of course an arbitrary one, but we believe it is supported by the current thinking and writings of the practitioners of population dynamics and social theorists in general. These four elements or tools are: regional growth poles; new towns and model cities; municipal land corporations; and local government reform.

REGIONAL GROWTH CENTERS

This is perhaps the most important of the four elements, because it can be the focal point for the application of the other three. The idea is to develop an urban center that would deflect or redirect population growth away from the suburbs in large metropolitan areas and that also would serve the needs of rural areas of the immediate region. These urban centers would provide residents of rural areas with job opportunities as well as a social and cultural infrastructure in which they can participate. The development growth center is basically the stimulated and controlled development of intermediate size cities with

the idea of diverting those who would otherwise migrate to or remain in the large metropolitan areas to these smaller urban centers. The centers chosen would already have a residential and industrial base and thus could provide basic community services. The idea is to begin with a series of smaller cities, say 50,000 to 250,000 population, and utilize their population growth potential to a maximum of roughly 500,000 persons. It is in these centers where the greatest potential for growth lies and it is in these communities where Federal, state, and local planning and financial assistance can be used most effectively in satisfying the goals of a national population redistribution program.

A basic problem with this concept is the identification of these growth centers. Numerous attempts have been made in the U.S. and other countries to identify potential growth poles or centers. One characteristic of a growth center is its ability to attract industry in order to provide the jobs necessary to support the planned population of the center. Industrial location theory holds that industrial location is primarily dependent upon: (1) transport costs of raw materials and finished products from and to resource location, production sites and market locations; (2) labor costs; and (3) agglomoration economies (Weber, 1929 and Izard, 1956). These three factors taken together determine whether or not an industry will have a competitive advantage in the market place and will determine whether or not a city or region can compete in interregional trade.[42,43]

Transportation Systems. A major requirement of potential growth centers is that they have access to and from the surrounding rural areas and to the large metropolitan areas that provide ready markets for the goods and services produced in these communities. Highway, rail, and water linkages to regional and world markets often determine the way in which communities grow. A study done for the National Water Commission by Rivkin/Carson Inc. in 1971 concludes that "places with highway access do have a greater chance of growing and less chance of losing population than others" and that highways enable communities to become more metropolitan.[44] With regard to water transportation, the same study indicates that access to water transportation was an important factor of growth (population and economic) in the past and that the twenty largest SMSA's are located on water. However, it was shown that the relationship of water transportation and potential growth is not now as close as in the past.

The availability of a rail transportation system is often taken as a given factor because the existing railroad network is so extensive. All of the communities that may be considered as potential growth centers presumably would be served by a rail transport system. An existing transportation system is a prerequisite to industrial and population growth because of the enormous capital outlays needed to provide these transport services and the delays that may be incurred in inducing industry to locate in potential growth centers.

Labor Force. According to industrial location theory, the availability of low-cost labor is an important factor in locational decision making. The parameters that become important in measuring the potential for savings to industry in labor costs include: the size of the labor force, the distribution by occupation, the productivity per occupational classification, educational levels of the work force, special skills, the age distribution of the work force, the prevailing local wage rates of each occupational classification and the cost of living index for each potential center.

Agglomoration Economies. The economies of agglomeration are extremely difficult to measure, yet they play a significant role in the locational decision-making process.

The most quantifiable savings in this category are those realized from industry increasing the size of its operations to take advantage of economies of scale. The measurement of the various economies derived from large scale operations is within the capabilities of modern accounting procedures and the results can be used in locational analysis.

The second type of agglomoration economies is referred to as "localization economies" and is much less quantifiable than economies of scale.[45] The basis for these savings derives from the concentration of a particular industry at a particular location. The reasons for this concentration can be the result of a common skilled labor pool, common energy sources and needs, common needs for specific raw materials, common needs for special service industries such as machine repair and service, plus industries that complement each others output. These

savings are real, but, as mentioned, very difficult to measure. In any event, it is manifestly important that potential growth centers have an existing industrial base from which to work.

The third and final type of agglomoration economy is called "urbanization economies."[46] These are perhaps the least quantifiable of all because they include such factors as climate, water supply, the basic physical infrastructure of a community, taxes, availability of land, as well as social cultural and environmental factors. The NWC study, for example, shows that the development of water supply and water treatment facilities is not correlated to industrial and population growth, yet growth will not occur without the provision of these facilities.[47]

Application of the Growth Center Concept. In the U.S. the only experience thus far with this concept has been the programs of the Economic Development Administration (EDA) by which the Federal Government sought to stimulate growth in various economically depressed areas of the country. These programs leaned heavily on investment in transportation systems and direct financial assistance to designated growth centers within a given region. The overall program was not too successful. Apparently, the majority of growth centers selected were below the minimum size required to attract and foster economic growth. For example, of 204 growth centers in the EDA program, 89 percent had a population of less than 50,000 and 70 percent less than 25,000.[48] In addition, the selection of these centers was made by the states each of which applied its own selection criteria. Also, it appears that the three basic locational factors discussed earlier were not generally accorded the importance that they merit. The crux of the matter seems to be that it is not enough for a

growth center to be able to grow by itself but it must be so related to the surrounding rural area that growth in the center strengthens the economy and improves the living standards in its periphery (Fuller, 1969). This means that there is some minimum size required of the growth center before the economies of agglomeration can be fully exploited.[49] The upshot of this is that much more research will be required before this particular concept is ready for use. Inasmuch as this population distribution tool is the one on which the others turn, the urgency regarding additional study and experimentation of the growth center concept is readily apparent.

There are various methods which have been proposed and tried in order to evaluate growth determining parameters. One is an input-output model for a specific growth center which tests how investment (federal, state, local) in any one sector of the center's economy affects other sectors. Another involves the use of an economic base study for a particular region and its growth center. This approach focuses primarily on employment and labor participation rates for various industries. Both of these methods have at least two shortcomings. Neither method results in a ranking of growth potential and many socio-economic, cultural and environmental factors are left out.

A third approach attempted in Canada does not have those shortcomings just mentioned. We would be remiss in our task if we did not include in this chapter a description of this interesting analytic model. Known as the Hodge Model, it is based on regression and factor analysis. The details are complicated, so a brief description is presented at this point while a more detailed treatment is provided in a short appendix to this chapter.

The characteristics of potential urban growth centers are described by 32 variables; e.g., population size, highway access, median value of dwellings, and labor force in services. These variables are tested against each other with numerical values being assigned to their relationships. A positive value indicates a direct correspondence, a negative value signifying an inverse correspondence. The numerical value indicates the degree of correspondence. After this testing, the set of 32 variables was narrowed down to 7 and these were then referred to as "dimensions". Each community under study is scored on this set of dimensions and is assigned a ranking.

See the appendix to this chapter for a more complete description of this model.

Considerable attention is being given to the application of the growth pole or growth center concept. In the United States, the first attempts at applying this approach were not entirely successful. Although the literature is rich with the theory and tests of the various facets of this theory, considerably more research is needed to produce a workable concept. The importance of this element in terms of balanced population distribution cannot be overemphasized. The other three major elements which are to be discussed next are intended to work in conjunction with the growth center concept.

NEW TOWNS AND MODEL CITIES

New Towns Program. The new towns concept has often been considered as one means to promote balanced growth and a better environment. As envisioned, the development of new towns would: (1) save money through efficient design; (2) provide for the development of a sense of community; and (3) offer a life style enhanced by open spaces and recreational

opportunities. The basic idea is to provide Americans a viable and attractive location where they could live, work and play.

The problem with new towns is that they could be expected to absorb only a small percentage of the metropolitan or rural population. For example, to accommodate the expected population increase in new towns over the next 30 years, we would have to build three cities the size of Houston, Texas every year until the year 2000. The 70 new towns that have been proposed or built since 1947 in the United States have absorbed less than one-third the present population of Houston.

Another problem with this approach is that the new towns tend to attract in disproportionate numbers the white middle and upper income residents of central cities and suburbia. The new towns developed to date have all been located about 50 miles from large metropolitan centers with the result being that they have turned out to be additions to suburbia in a megalopolis rather than autonomous new towns. The poorer elements of society are excluded because they lack the resources to buy into this new version of the "suburban club." Thus, new towns do little or nothing to alleviate the plight of central cities.

Other problems that come into play are largely economic and institutional in nature. These include the balancing of supply and demand for labor, housing, hospitals, schools, shopping facilities and other service industries in order to place the provision of these goods and services on an economically justifiable basis. The logistics of these problems are tremendous.

Model Cities Program. The Model Cities program in its present form is basically a system of block grants to cities, dependent upon the submission and approval of plans by the city to the Federal Government showing how these plans would help disadvantaged areas. The plans are to provide for improving education, job training, employment, welfare, health and the physical development of disadvantaged areas. Cities eligible for this program receive two types of grants, one for planning and the other for implementing the plans. The implementation grants cover up to 80 percent of non-Federal costs of carrying out the plans. The basic idea of these grants is to improve and enhance the urban environment making the cities a viable option to individuals seeking to improve their conditions of life.[50]

As originally envisaged, the Model Cities program was to concentrate large grants in relatively few cities. However, political opposition to this approach resulted in a larger number of cities receiving smaller grants. In this way a potentially good program was undermined.

Another serious problem with the program was the manner in which community and neighborhood organizations were treated when they attempted to express their opinions of various plans for community improvement. HUD, the responsible agency for the program, had set down a requirement that local organizations be given a voice in the planning process. In reality, however, these organizations had little or no voice in the planning process and the program, which was designed to help these neighborhoods, became one of a block grant to cities to do with as they pleased.[51] Strong administration of the program by HUD was clearly lacking.

Urban Renewal Program. This program has been in effect since 1949 and it is the largest and oldest Federal program for improving the physical condition of cities and towns. Since 1949, the Federal Government had appropriated about $10 billion for the program. To date, only $5.2 billion has been spent. Of the 2531 urban renewal plans approved or expected to be approved, only 733 were completed by the end of 1971.[52]

The program is designed to aid local governments acquire all real property within renewal areas, raze structures, and assist displaced families with moving allowances. After the land is cleared, local governmental units then either sell the land to private developers or use it for public facilities. The Federal Government covers two-thirds of the difference between total local government expenditures for the project and the revenue received from the sale of the land.

The main problems with the urban renewal programs are that many existing neighborhood patterns are disrupted and that local governments are generally slow in the preparation of renewal plans.

In the sixties many urban renewal programs were designed to revitalize central city areas by providing the means and the lands to develop housing stocks, transportation systems, public facilities, and commercial and industrial buildings. Large tracts of slum housing were torn down in a direct attack on urban blight. Yet these slum areas were replaced by middle income and upper income apartment complexes, office buildings and public facilities and not by housing or facilities for the former residents. The result was that the program was drastically reducing the supply of low cost housing, causing slum areas to develop in other parts of the cities.

In 1969, Congress stipulated that cities must build as many new low-cost and moderate-cost housing units as are demolished during the renewal project. In addition, the Neighborhood Development Program was established by Congress to mitigate the problem of total disruption of existing neighborhood patterns. The program allows for spot demolition, spot construction and building code enforcement within neighborhoods rather than designating a large area for urban renewal.[53]

MUNICIPAL LAND CORPORATIONS

Many of the problems associated with population distribution in metropolitan areas are directly related to the suburbanization trend that began immediately following World War II. The availability of land, a little money, and low interest rates made the American dream of owning a single dwelling on a parcel of land a reality for many. In the process, huge areas of agricultural land were taken over for development. Sacrificed were the very open spaces and the quality of environment that the suburbanization movement sought to achieve in the first place. In its most simple form, the problem is a conflict between the desire for open spaces and land needed to feed residential and commercial growth. In the last twenty-five years this growth has proceeded full blast with only the most minimal of checks imposed by local governments.

The major questions are: how should land use be controlled and who should do the controlling. In the United States, although the individual states have the constitutional power to do so, control over land use has been an exclusive function of local governmental units, primarily municipalities. This control is exercised by limited public ownership of lands, easements, and zoning. The success of these controls is, for the most part, dependent upon the economic and protective desires of the local

citizenry. Zoning is the method most widely used, but its general ineffectiveness is evidenced by the most casual look at a typical suburban community. It is apparent that zoning occurs more often than not after development has already taken place and that this methods of control is implemented at the wrong level of government. In other words, it is used at the municipal level rather than on a metropolitan, county or regional scale.

The municipal land corporation concept involves the creation of a public or quasi-public corporation that is authorized to purchase and own land in the periphery of metropolitan areas and in the hinterlands in order to have public control over land of potential use for urban growth.[54,55] This corporation would be set up to control the location, the design, the sequences, and the tempo of urban growth and development while at the same time controlling population densities in these areas.

Its powers would include the ability to purchase, condemn, rent, leaseback or sell real property. This corporation could work closely with Federal Urban Renewal, Model Cities and New Towns programs. In addition, its power could be extended to include site development, such as the provision of transportation linkages, major sewers, main water lines and open spaces for recreational development.

The benefits from a non-profit corporation of this type would be manifold. First, it could put an end to land speculation which distorts the growth patterns of cities and adds additional costs to the provision of a housing stock and other elements that are a part of urban development. Since the corporation would be non-profit in nature, a result would be lower or at least stabilized land costs with the savings passed on to consumers. In addition, the corporation, being eligible for Federal and state grants and loans for the purchase and development of land, would be able to finance these purchases at lower rates of interest.

Second, land would be available for public use thus mitigating, somewhat the problem of public provision of certain goods and services which may have been otherwise delayed because of the lack of adequate sites or land for public development programs.

Third, the corporation could assure developers a uniform flow of sites available for residential, commercial, industrial and recreational development.

Fourth, the corporation would be in a position to direct or redirect urban growth and promote continuous development in a way to be consistent with planned population densities.

Fifth, the corporation would be in a position to offer alternative residential locations to individuals, usually the poor, aged and black, displaced by urban renewal or other similar Federal or state programs.

Sixth, the corporation could control the actual number and location of urban renewal programs within a particular metropolitan area and in some way preserve and enhance the livability of existing housing stocks.

Finally, there are the benefits to private builders and contractors. By maintaining control of the amount of land and the number of sites available, for example, residential construction, the smaller builder could again become competitive in the housing market. Land purchases and site development would be a single fixed cost and since the corporation is non-profit in nature this cost would be considerably lower than costs in the existing speculative market for land. This cost could also include the surveying and legal expenses associated with land purchase and development.

Builders and contractors could then concentrate on doing what they do best, that is, construction and sales rather than site development. In addition, conflicts between private vs. public use of land would be resolved by the corporation.

The corporation would have to be created at the state level with enabling legislation that would specify the powers and organization of such a corporation or agency. Initially, Federal or state grants or other state-provided appropriations would be needed for initial land purchases. Initial land purchases, would more than likely be in the hinterlands, outside of the existing metropolitan periphery. In this way, the corporation would avoid the higher cost land already virtually committed to metropolitan growth. As urban renewal programs are instituted, the corporation would be able to utilize Federal funds in order to purchase land within the metropolitan area. As part of the planning function of this organization, a comprehensive master plan for metropolitan growth would be developed that would identify future needs for all type of land uses including residential, commercial, industrial, public, and recreational uses. Within the context of this master plan and according to some predetermined sequence for controlled metropolitan growth, detailed site planning would be instituted on land scheduled for early development and sale to builders, contractors, or other commercial or industrial interests. The basic stipulation would be that only a specific type of development will be allowed to occur and that the land may not be held idle. Once the cycle of land purchase, development, and sale is completed over some period of time, the corporation should become self-sustaining with little or no supplemental appropriations from the state government. However, this would not prevent the corporation from sponsoring or participating in existing or future Federal or state grant programs.

There are, however, a number of major questions that need answering with respect to the formation and the powers of a public corporation of this type. These questions include possible legal barriers, the scope of power, and the methods of land acquisition and disposal.

The legal barriers include some aspects of common, statutory and constitutional law. However, in recent years there has been an increasingly liberal interpretation of these laws by the courts with respect to public acquisition and ownership of land as a result of litigation arising out of urban renewal programs.[56] The courts have ruled that such acquisition is legal if it is purchased to eliminate slums, reduce urban blight, or if vacant land is misused or needed for public services. The landmark Supreme Court case in this respect is Berman vs. Parker.[57]

The second potential obstacle concerns the power and scope of the proposed corporation. Questions arise as to whether or not the corporation should have broadly defined land use control powers or powers restricted to serving only a small segment of land use control, such as land use planning, urban renewal, and public projects. However, given the broad goal of controlling metropolitan growth and development, the latter restrictions would make such a corporation ineffective in the sense that land speculation, haphazard growth and urban sprawl would continue.

The final barrier is one that is concerned with the method of disposing of lands owned by the corporation. The question arises as to whether or not land made available for development should be leased or sold and should public ownership be temporary or permanent. With respect to selling or leasing this land, the study by John Reps indicates that either method can work given the goal of effective control over metropolitan growth. He cites the

experience of two cities in the Netherlands:

> The two largest cities follow different practices. Amsterdam leases all land except for industrial sites, which are sold. Rotterdam sells all land except for industrial sites, which are leased. Both cities are highly successful in shaping patterns of urban growth almost exactly as planned. Appropriate covenants or lease restrictions specify the details of development to be followed by private builders.[58]

However, the biggest advantage to the corporation with respect to control of growth and development comes with a system of leasing land for development. In this way more lasting controls can be exercised over the conditions of growth. However, this does not rule out the possibility of outright sale of land, providing, of course, that any increase in land value be taxed away by some form of property or capital gains tax by the corporation or state.

The final question is what are the prospects for success of such a corporation? Public ownership of land has been extremely successful in European and Scandinavian countries and a more modest program has had some success in Canada in the Province of Ontario. The principles of public ownership of land for control of urban development trace back throughout the nation's history. The lands on which the cities of Washington, D.C., Austin, Savannah, New York, Detroit, and San Francisco stand were all publicly owned lands initially purchased to control the urban development of these cities. In later years, however, the individual right to own land to use it virtually without restriction has led to the situation where land use control has slipped away from state and municipal governmental units.[59] The restoration of this control to the states will not be easy. Private interest groups of every description can be expected to resist such efforts, if they are mounted.

LOCAL GOVERNMENT REFORM

Throughout the country's history up to about 1930, state and local governments had the primary responsibilities of serving the needs of their citizens. State and local expenditures for goods and services were about three times that of the Federal Government.[60] With the advent of the depression, this situation changed radically. Public necessity required that the Federal Government fill in many of the large gaps in the public sector for which local and state governments could not or would not assume responsibility. The taxing and spending powers of the central government were used to pull the nation from the depression and afterwards to prevent another depression. This greatly enhanced role of the Federal Government has been sustained to the present day. Local and state governments continue to look to the national government for aid in the solutions to their growing problems. Special interests are also finding the Federal Government more responsive to their needs. The result has been a concentration of power at the Federal level and dependency of the states and local governments on Federal aid.[61]

With the Federal Government holding the purse strings, it is in a position, through its grant programs, to promote national goals. It is in this context that we believe the Federal Government can most effectively pursue the goal of population redistribution.

The Federal Government should encourage the states to develop multi-county economic regions in order to establish priorities in maintaining or revitalizing areas essential to the economic health of the state.

Within this broad context, states could identify regions which have potential value in recreation, natural resources, agriculture, and industrial and commercial growth. Within such regions, the states would cause to be

formulated comprehensive plans for development. This planning should be a condition to related Federal aid. With respect to population distribution, state planning would include control over the location of transportation systems, resource development and land use. Target populations could be established for each region or cities within each region. By controlling access to and from cities or regions, controlling the development of resources and control over the location of new housing and industrial parks, the state can effectively control population distribution.

The literature abounds with information about the fragmentation of local governmental units and their overlapping and underlapping jurisdictions. Presently, there are over 81,000 local governmental units of all types in the United States, of which 18,000 are municipalities.[62] By the year 2000 the number of municipalities is expected to double. We have a situation now where local units of government jealously guard their own jurisdictions with little regard for the consequent diseconomies. The result is a needlessly higher tax burden for the taxpayer at a time when he feels he is already being overtaxed and is resistant to further tax increases. The Federal Government, as a condition of grants, should encourage the states to use their powers to effect a substantial reduction in the number of political and special purpose jurisdictions.

The scenario of a possible application of the local government reform approach might be composed of three phases. The first phase would be the gradual assimilation of municipal services by county governments. This phase would be applicable to both rural and urban counties.

The second phase would consist of forming an Urban County government and is a natural progression from the first phase. It would be a simple formalizing by the state of the county's role as a coordinator of municipal

programs. Additional powers could be granted by the state to the counties to provide similar services to unincorporated areas and to control also the development of unincorporated areas through land use controls and the sponsoring of programs that stimulated growth within the county. Again, this phase would apply to rural and urban counties.

The third and final phase would be applicable, primarily, in urban areas. Since growth is not restricted to political boundaries, whether they be municipal, county, or state, some means must be found that would satisfy the needs of large metropolitan areas. In this case, local government reform at the city and county levels could be used with the formation of metropolitan governments which could and would cut across county line jurisdictions. Two or more phase II county governments could be consolidated into one large metro-government using the outer boundaries of the combined counties as the new jurisdictional limits. In this way, counties not affected would retain their historical jurisdictions. In rural areas or counties it would be possible, but not necessary, for counties to combine into some form of regional government similar perhaps to the Economic Development Districts of the EDA.

The basic premise here is that the Federal Government can and should influence the states to initiate a program of county development by specifying this condition as necessary prior to receiving large grants for community development. With a long history of government programs having an indirect effect on population distribution, it is possible that subtle or even less than subtle pressures can be applied to states as a means to satisfying a national goal of controlling population distribution while at the same time preserving or stimulating the economic viability of the states indirectly through local government reform of some type.

Population Redistribution Strategies

The basic tools of a national population distribution have been identified and described. In this concluding section, we show how these elements can be combined and recombined to address the problems of each of three living environments: rural; intermediate size (50,000 to 250,000 population) cities; and the large metropolitan centers.

RURAL AND NON-METROPOLITAN AREAS[63]

The population in these areas constitutes about 30 percent of the nation's total population. Migrations from these areas have occurred in the past and are continuing to this day. The result is that large areas of the nation are becoming depopulated at a time when the population as a whole seems to prefer living in open space areas. This paradox is attributed to individuals seeking economic opportunity regardless of personal preferences as to where they would like to live.

The problems of rural areas are familiar to us all. There is a lack of educational and economic opportunities. With employment opportunities limited, an individual seeks economic improvement in urban areas, but is frequently unprepared to compete with his or her urban counterpart in the job market and is often less capable of adjusting to urban living. Each new arrival does his or her part in bidding up the already inflated rent levels of low-income housing and bidding down the already inadequate wage levels for unskilled workers. Slums and swollen welfare rolls are the dismal consequence. This phenomenon has been occurring in every country since the advent of the industrial revolution. The U.S. has been no more successful than other countries in solving this wrenching social problem.

In rural and non-metropolitan areas the need is apparent. Federal and state aid is needed to: 1) improve the quality of education and job training in these areas to increase employability of the residents; 2) upgrade the quality of existing housing stocks and develop programs to assist in providing new and low-cost housing; 3) upgrade existing health and welfare services; and 4) assist communities in these areas in providing basic community services such as water supply, waste water treatment, police and fire protection along with other basic governmental and administrative services. The methods available for use in meeting these goals include a restructuring of existing grant-in-aid programs at the Federal level and some type of state-sponsored municipal reform.

The studies by Hines, (1971) and the President's National Advisory Commission on Rural Poverty (1967) clearly show the inequality that exists in Federal grant-in-aid programs in rural and non-metropolitan areas. While rural and non-metropolitan areas contain over 50 percent of the nation's poor, they receive on the average less than 25 percent of the benefits from these programs.

In 1971 Congress passed a bill on a Revenue Sharing Program for Rural Development.[64] This program provides funds for job training, health programs, transportation systems and programs to develop the basic infrastructure of smaller communities. The legislative proposals combine a number of existing programs, add some additional funds to these programs, and redirect these programs toward the basic needs of rural communities through state and local administrators. In addition, rural and non-metropolitan communities would qualify for other revenue sharing programs for building their human resource base and public service infrastructure. A potential

drawback to these revenue sharing proposals is the amount and type of cost sharing that may be required at state and local levels in order to participate in this program. As in the past, richer communities have been able to take advantage of Federal programs because they could obtain the cost sharing funds necessary to qualify for these programs. There is no intention here to go into a detailed discussion of cost-sharing, it is simply cited as a potential obstacle to rural and non-metropolitan development.

In order to mitigate the problem mentioned above and also to aid rural communities in effectively and efficiently coping with their problems, it is suggested that the local government reform approach might be used to good advantage. As discussed earlier, the first two phases of local government reform would be applicable in rural and non-metropolitan areas. Since these smaller communities have similar problems, that is limited funds and a declining tax base on one hand and the need for basic community services on the other, it seems obvious that a larger local unit of government would be able to provide better services at lower prices. The initial phase would be the gradual assimilation of municipal services by county governments or by some established municipal district similar to the Economic Development Districts of the EDA program. The assimilation would occur through contractual arrangements between existing municipalities and the county or district government and the provision of these services to unincorporated areas under some type of tax or payment scheme.

The second phase of this proposal would be that of forming an Urban-County government which is a direct progression from the initial phase of local government reform. It would be simply a formalizing of the county's role as a coordinator of municipal programs.

With this new status and a wider tax base, the Urban County government would be in a position to meet its share of the costs in Federal grant-in-aid programs. The Urban County government would then be in a position to direct funds to communities and areas within its jurisdiction where the need is most urgent.

The basic idea is to create an environment that will encourage the residents of rural and non-metropolitan areas to remain in these areas, while at the same time upgrading their educational levels and job skills for participation in a regional labor market. It is envisioned that residents in these areas would seek and find employment in a designated regional growth center. In other words, these smaller outlying communities would serve as "bedroom communities" for the larger growth centers within a region. As stated earlier, it is quite possible that a non-metropolitan community of from 25,000 population to 50,000 population could be designated as a regional growth center that would serve the social and economic needs of residents of the nearby rural areas.

INTERMEDIATE SIZE CITIES

As stated earlier, this part of the national program is concerned with cities ranging in population size from 50,000 to 250,000. In addition, these cities must be independent communities not generally considered to be a part of a large metropolitan area or megalopolis. In the past 10 years, the populations of these cities have grown 21.2 percent, considerably in excess of the national increase in population of 13.3 percent.[65] It is in these communities where there is the potential to absorb about 25 percent of the projected population increase over the next 30 years.

These cities for the most part are at a stage in their growth where they do not have the serious environmental, social, economic and political problems that major metropolitan areas now have. This is not to say that these cities do not have problems, because growth in itself creates problems in planning for and serving the needs of an expanding population and economy. The salient feature here is, that the problems that could develop in the future are at a point where they can be managed if proper action is initiated now.

With respect to a population redistribution program, these cities offer the hope of providing a substantial segment of the nation's population a life style and a quality of life not to be found in the large metropolitan centers. These cities, with their existing commercial, social and physical infrastructures, offer the potential for achieving these ends. One of the methods that can be used to develop this potential is the implementation of the regional growth pole concept.

This element can be considered the key to the success of a national population redistribution program. Within the framework of this approach, efforts would be made to develop an urban center that would serve the needs of its residents as well as those who live in the city's hinterlands by providing job and business opportunities, and social, governmental, cultural and recreational services.

The primary problem with implementing this element of an overall national program is in identifying which cities will be designated as growth centers. The parameters and methods that could be used in identifying these centers were discussed earlier. Once the centers have been identified, the Federal Government should, in collaboration with the state involved, seek

the means to encourage: 1) the expansion of the existing industrial base, 2) development of an efficient transportation system, and 3) the means to develop the center into a city that will attract people from large metropolitan areas.

The question is asked, what is to prevent these medium size urban centers from going through the same cycle as the larger metropolitan centers, i.e., the flight to the suburbs, de facto racial segregation and the decay of the inner city? The answer lies in the simultaneous application of other population distribution tools. For example, the concepts of the New Towns and Model Cities element could be used to expand and develop these growth centers. New Towns, Model Cities and Urban Renewal programs can be used to develop housing stocks for all income classes, as well as community, health, education and recreational facilities. These centers would have a capital structure with which to work: cultural facilities, schools, hospitals, library systems and various other public services. These physical manifestations of progress will produce psychological benefits in that residents will take pride in their community. Talented younger persons would be induced to stay and former residents to return from the large metropolitan areas to which they moved in search of economic opportunity.

A simple face lift and improved community morale would not be enough, however. There has to be an element of control — control over population densities; land use and development; preservation or enhancement of environmental quality; and other community functions. There are two elements that might be used in this context. They may be used independently or in combination because there is a certain amount of overlap in their functions. These two elements are the municipal land corporation and local government reform concepts.

The municipal land corporation element offers Federal, state and local planners the means to control the size and the pattern of population distribution of a selected growth center. A public or quasi-public non-profit corporation would be authorized to purchase, plan, develop and sell or lease land for residential, industrial, commercial, and public uses. A comprehensive land use plan would be developed that would specify population densities, size and phased development patterns for the center. This would include planning and constructing transportation systems, water supply, wastewater treatment facilities and drainage systems. By developing these systems and facilities plus the functions of owning and selling or leasing land for development, substantial control can be maintained over physical growth and population distribution in the center and the surrounding rural areas.

Federal, state and local planners can influence and control the growth development of these centers through the administration of Federal and state grants. The municipal land corporation would act as the sponsor for the New Towns, Model Cities and Urban Renewal programs of the Federal Government. In addition, Federal funds for the development of transportation systems, water supply, waste treatment and drainage systems are also available. Furthermore, revenue sharing provides funds to states and local governmental units for the development or improvement of the community infrastructure and of essential public services.

At the state level, state governments would have to enact the enabling legislation for the formation of these municipal land corporations. In addition, they would have to appropriate funds for the corporation until it becomes self-sustaining. Perhaps new Federal programs can be instituted to aid these states in the formation and support of these corporations.

Local governmental units, county and city, would also participate in the planning process. In effect, the municipal land corporation would be the city's and/or county's planning agency. Enabling legislation could include provisions in the organizational structure of the corporation for combined city, county, and state control over growth and land use development. The local governmental units' stake in this process would be that of having an economically viable and esthetically appealing community.

Federal and state aid to these centers would not necessarily be continuous. For once the target population of a center is reached, Federal and state aid could be transferred to other potential growth centers. Growth would not cease, but it would be reduced in rate, and the mechanisms for controlling haphazard growth will have been established.

The second element that could be used to control growth in growth centers is implementation of the local government reform concept. As stated previously, this element could complement both the municipal land corporation and the New Towns and Model Cities elements of a population redistribution program.

The application of this concept would broaden the scope and control of municipal governments over the environmental, social, political and economic problems associated with growth and population distribution within a growth center. From past experience in larger metropolitan areas, it can be seen that many of the problems associated with growth or the lack of growth and economic vitality are not restricted to local political jurisdictions.

Problems of poverty, environmental degradation, police protection, fire protection, health, and education are problems that could detract from a city's competitive position for growth. In addition, the cost of

these services has created tremendous strains on local and state governmental fiscal resources. Within the context of the growth center element, these problems could be mitigated or even eliminated before they get out of hand. The solution lies in limiting the number of political jurisdictions in these centers in order that workable coalitions can be formed to anticipate, plan for, and solve the problems associated with growth.

The first phase, already discussed, involves entering into contractual arrangements with either the municipal government of the growth center or with a county unit of government that would service the needs of the center and the region. Initially, these might include municipal water supply and waste treatment facilities, drainage systems, educational systems, health services, police and fire protection. As growth continues, the second phase could be initiated that would form an Urban-County municipality type local government. Functions would be expanded to include land use planning and control and perhaps the formation of a municipal land corporation that would act as the planning arm of this governmental unit. This Urban-County governmental unit would have in its governing body representatives of the urban center itself, representatives of any suburban community in the periphery of the center, plus representatives of county governmental units. This unit of government would assimilate the taxing authority of municipalities and oversee the growth and development of the metropolitan center. Powers could include control over air and water quality and participation in Federal and state programs on housing, urban renewal, welfare, health, education and so on.

The final phase would then consist of expanding the jurisdiction of the metropolitan government to include surrounding counties as they develop into urban oriented entities. The metropolitan government would then consist of representatives from all counties and municipalities within the

jurisdictional boundaries of the government. These boundaries would be the combination of perimeter boundaries of existing counties, thus mitigating the problem of changing historically established boundaries throughout a state.

The key to successful implementation of this element is the state government. It would mean perhaps constitutional changes in "home rule" states and the return in some cases of the power over the municipalities to the states. The original power alignment would thus be restored.

MAJOR METROPOLITAN AREAS AND CENTRAL CITIES

The third aspect of a national population redistribution program presents planners perhaps their biggest challenge. It is within these large metropolitan centers that are found the most intractable social, economic and political obstacles to improving the quality of life for all who live and work in them. The barriers are many and need not be detailed here. They can be summed up by the term social injustice. Even after two hundred years of nationhood, large segments of the citizenry are denied effective access to the processes of public decision-making.

The basic goals are much the same as those of the intermediate size cities. They include: upgrading the quality of life for the poverty stricken groups in central cities; revitalizing central city areas to make them an attractive locational option for firms and individuals; and stemming the suburban growth that continues to gobble up open spaces, drain the resources of central cities and perpetuate the geographical separation of blacks and whites.

Perhaps the most important element in dealing with the problems in these areas is implementation of the local government reform concept. The application of this concept in the present case might include: 1) control over suburban growth either through control of land use by a metropolitan government or perhaps the formation of municipal land corporations; 2) broadening the tax base of the metropolitan area where income distribution programs can be instituted to revitalize communities with declining resources; 3) effective control of environmental degradation; 4) the ability to carry out Federal and state programs that would contribute toward upgrading the quality of housing, increase the income, and increase the quality of job training, education, health, and welfare services primarily in central city areas for low-income people; and 5) the development of an integrated system of communities with transportation and communication linkages that offer all residents equal opportunities for employment throughout the metropolitan area. As stated previously, the impetus for such urban reform should come from the state level and will require, in many cases, major changes in the traditional relationships among states, counties and municipalities. The catalyst for this change could be the Federal Government through a grant-in-aid program designed to support local government reform programs.

At the Federal level, there should be a consolidation and recasting of existing programs. One such reform could be a part of the New Towns and Model Cities element previously discussed and implemented through, possibly, a municipal land corporation, an Urban County, or a metropolitan type government. The consolidation of Federal programs would provide for the development of public facilities, housing stocks, recreational facilities, open spaces and the refurbishment of existing housing stocks. It could also

include the development of mass transit systems, parking facilities and a general revitalization of central business districts.

A second element that can be used in these large metropolitan areas is the municipal land corporation element. Assuming for the time being that meaningful municipal reform does not take place, it would still be possible for the states to establish these corporations in large metropolitan areas. The corporation would perform the vital function of planning and controlling land use in the metropolitan area and its periphery. Given the powers, it could contribute substantially in revitalizing central city areas and it could stem the migration of the white community to the suburbs by restricting land use in the periphery of metropolitan areas. New housing, or rehabilitation of existing housing stocks utilizing the New Towns and Model Cities element could be encouraged in central city areas. Population densities could be controlled by specifying the type of residential development that could occur. Furthermore, the corporation would be able to develop a comprehensive plan for the orderly expansion and growth of the whole metropolitan area, while preserving open spaces and enhancing the livability of the metropolitan community.

FINAL COMMENTS

A national population redistribution program must meet certain criteria. First, it must be flexible. Population growth rates and patterns of distribution have shown a facility for fairly rapid change in this country. Therefore, the program must be sufficiently flexible to accommodate further changes in the future. Second, a population redistribution policy must be acceptable, not just to the President and Congress, but to the courts, and to many, if not most, of the corporate and individual interests that will be affected by

the policy. The poor may feel ill-served by present patterns of distribution, but it should be kept in mind that these patterns reflect deliberate choices of the affluent who may well resist major changes. Third, the policy must be workable. Governments must have the means to implement a policy that is sufficient to the task and that enjoys broad public support.

It was mentioned early in the chapter that governmental programs, like the highway program, have had substantial unintended effects on population distribution. However, it is doubtful whether attempts to turn these public policies and programs directly to the task of achieving a salutary population distribution will be politically acceptable. The existing programs serve other powerful interests and other important objectives that will not be abandoned. However, an awareness of their distributional consequences must be recognized and publicized.

The human resource programs designed to provide health, welfare, education, job training, and job placement services to those poor lost in the distributional shuffle have been with us for many years. They have not as yet proven to be workable solutions to distributional problems. Many analysts would argue that these programs are not generally acceptable to the American public and, as a result, have not been given the support necessary to make them work.

Substantial government subsidies will be needed to make the Growth Center and the New Town and Model City elements of an overall population distribution strategy work. The task of deflecting growth from large metropolitan areas to these smaller areas is a monumental one, and may well be beyond our capacity.

The reorganization of local governments into regional units has been attempted in a few places in this country with very mixed results. There is substantial resistance, especially among suburbanites, to any plan that would encroach on local autonomy. In most states, the annexation or consolidation of suburbs is a cumbersome process. The residents of suburbs have great political power at all levels of government and it seems unlikely that their wishes will be denied.

The present patterns of population distribution serve the interests of many, but create a multitude of problems as well. Many government programs have attempted to deal with these problems. For the most part they have been unsuccessful in changing the pattern of population distribution. As for the present, it seems that the nation is yet a long way from implementing a national population distribution policy that would be flexible, acceptable, and workable.

Appendix

The Province of Ontario has been confronted with the problems associated with rapid population growth for several years. The provincial government, recognizing the importance of planning for balanced growth, sponsored the research of Gerald Hodge of the University of Toronto, who developed an analytical model to identify growth poles in Eastern Ontario (1966).[66]

The model is based on the use of both multiple regression analysis and factor analysis. Multiple regression analysis was used to determine the degree of association between variables of urban development and community performance. Factor analysis was then employed to identify any underlying community traits common to all communities. These traits emerged as clusters of the original variables. Thirty-two variables were used in the study and these were reduced to seven clusters or traits common to all the communities. The performance (or score) of these traits then measured the growth potential of a particular community. The thirty-two variables were grouped into four general categories: (1) Demographic and Social Characteristics; (2) Physical Development; (3) Geographic Situation and (4) Economic Base. Table A shows the list of variables used in this analysis.

The purpose in using these many variables stems from the fact that no single variable is sufficient to describe the real nature of growth and development. By measuring the interrelationships of a large number of variables, it is hoped that the complicated nature of urban growth and its problems can be defined.

The first step in this procedure is to derive the statistical relationships between all variables. This is defined as the degree to which one variable of urban development is found to exist in the presence of another variable. The relationships are expressed in terms of numerical values and correlation coefficients (r), and are interpreted literally as the probability in which one could expect variables to coexist. The numerical relationships developed in the Hodge model are shown in Table B. When the value is negative, an inverse relationship exists between two variables. As an example, with a fast growing population (variable 2) the age of the housing stock (variable 20) is less likely to average over 20 years. From Table B, it will be noted that the correlation between these two variables is -71, an indication of a high degree of inverse correlation.

From this the problem is one of identifying groups or clusters of interrelationships, since individual correlations do not permit a positive statement of the causes and effects of urban development. The basis for using factor analysis to identify the groups or clusters of interrelations is that urban development and the interaction between communities is not a random process. It actually occurs in a variety of more or less regular patterns.[67] For example, one would expect the interactions of people, housing and jobs to result in a condition that takes on order and uniformity. Jobs, income, and housing would indicate the quality of housing or socio-economic status of a particular community. Thus, the primary objective of factor analysis is to identify the traits and their statistical bases that apply to the set of cities or towns being analyzed.

The traits emerge from the factor analysis and distinct clusters of the original variables. The clusters, because of their statistical properties, are the dimensions (or traits) or urban development. Each dimension is made up of a linear combination of all the variables and is somewhat similar to a linear regression equation. Some variables are more dominant than others and their factor loading, like a regression coefficient, characterize the relationship that exists. Factor loading, then, is a measure of the degree of closeness between each variable and the (dimension) cluster. The actual scores of each community in each dimension can then identify the performance of a community relative to the performance of other communities. Each community will achieve some score in each of the dimensions, however, the differences between the scores of various communities will provide a method or ranking the performance of one community against others. The dimensions (or traits) then can be thought of as explaining the interrelationships of people, events and physical environment in urban centers or as an indicator of the interrelationships that have occurred in the past.

In the Canadian experience, ten dimensions were extracted from the analysis of the 32 variables. However, only seven were considered as being meaningful and statistically reliable. The dominant factor loading of each variable either positive or negative, then suggested the definition of each dimension. Again, negative loadings indicate that as the variable increases in importance the value of the dimension decreases. The seven dimensions plus the type of score that would indicate potential growth are shown in Table C.

The intent of the foregoing description of the Canadian effort was to illustrate the principal features of the Hodge model. Insofar as we are aware, no similar model has been developed in the United States. The approach appears to have much merit. It would be a relatively simple matter to develop variables comparable to those used in the Canadian study for the United States and to use the model to determine potential growth poles or centers in the U.S.

TABLE A

Variables Used in the Analysis of Urban Development in Eastern Ontario

CHARACTERISTICS OF URBAN CENTERS	CODE
Demographic and Social Characteristics:	
1. Population Size, 1961	POPULA
2. Population Change, 1951-1961	POPCHA
3. Population Under 15 Years, 1961	POPU15
4. Population Over 65 Years, 1961	POP065
5. Protestant Religious Affiliation, 1961	POPROT
6. Roman Catholic Religious Affiliation, 1961	POPRCA
7. French Speaking Population, 1961	POPFRE
8. English Speaking Population, 1961	POPENG
9. Immigrant Population Since 1945, 1961	PIM45
10. Education Attainment of University Level, 1961	UNIVER
11. Education Attainment of Grade 11 or Better, 1961	GRAD11
12. Population Density, 1961	POPDEN
Physical Development:	
13. Value of Private Investment/Capita, 1964	CAPINV
14. Intensity of Private Investment (Value)/Acre, 1963	INTASS
15. Investment in Public Utilities, 1963	UTILIT
16. Level of Locally Provided Services, 1963	LOCSER
17. Investment in Commercial Property, 1961	INCOMM
18. Investment in Industrial Property, 1961	ININDU
19. Median Value of Dwellings, 1961	MVALDU
20. Dwellings Built Before 1945, 1961	DUSOLD
21. Dwellings with Furnace Heat, 1961	DUFURN
22. Dwellings with Hot-Cold Water, 1961	DUHCWA
23. High School Quality, 1963	HSQUAL
24. Hospital Quality, 1964	HSPQUA
Geographic Situation:	
25. Location of Nearest Competing Center, 1961	NEARES
26. Time-Distance to Nearest Metropolis, 1961	NMETTO
27. Highway Access, 1964	HIGHWA
Economic Base:	
28. Labor Force in Manufacturing, 1961	EMPMAN
29. Labor Force in Services, 1961	EMPSER
30. Average Family Earnings, 1961	FAMERN
31. Male/Female Employment, 1961	EMPSEX
32. Level of Retail Services, 1961	LEVRET

Source: Gerald Hodge, The Identification of 'Growth Poles' in Eastern Ontario (Toronto; Ontario Department of Economics and Development, 1966), p. 17.

TABLE B

Correlations Among Variables of Urban

Development, Eastern Ontario, 1961

Variables		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
1.	POPULA	...																															
2.	POPCHA	06	...																														
3.	POPU15	-05	64	...																													
4.	POPO65	-21	-62	-76	...																												
5.	POPROT	-13	-12	-39	38	...																											
6.	POPRCA	12	10	38	-35	-99	...																										
7.	POPFRE	08	04	27	-20	-33	84	...																									
8.	POPANG	-09	-04	-27	20	83	-84	-99	...																								
9.	FIN45	25	48	11	-38	30	-33	-32	32	...																							
10.	UNIVER	26	21	13	-28	-13	09	08	-08	28	...																						
11.	GRADII	33	25	-03	-29	28	-31	-33	33	57	68	...																					
12.	POPDEN	32	10	03	-34	-42	41	41	-42	10	17	17	...	.																			
13.	CAPINV	38	-21	-20	-07	12	12	-06	06	21	30	41	13	...																			
14.	INTASS	58	05	-09	-32	-27	26	27	-27	21	26	37	90	42	...																		
15.	UTILIT	08	-02	-06	-01	18	-23	-15	15	07	15	12	00	08	01	...																	
16.	LOCSER	43	02	-12	-24	13	-15	-11	11	36	30	50	23	52	49	18	...																
17.	INCOME	10	02	-15	20	-06	06	-03	02	-12	18	05	-06	-07	-07	10	12	...															
18.	INDIND	-01	-08	19	-28	-07	07	01	-01	-07	01	00	-03	50	06	08	35	-39	...														
19.	INVALU	49	27	-05	-37	04	-05	-01	01	60	36	70	46	44	65	-04	62	01	-02	...													
20.	DWSOLD	-18	-71	-49	65	20	-18	-11	11	-56	-24	-33	-34	07	-29	10	-11	-03	18	-54	...												
21.	DWPURC	35	30	-01	-29	19	-20	-13	13	45	29	63	25	39	44	07	46	-08	00	67	-41	...											
22.	DWRENA	26	27	-05	-35	28	-29	-22	21	45	30	63	27	33	42	21	63	-04	11	65	-34	73	...										
23.	HOSPAT	25	03	-07	-19	-07	05	03	-03	21	31	49	28	22	38	10	48	18	00	49	-17	47	53	...									
24.	EDFACA	17	-01	-13	-07	12	-04	-11	11	03	02	19	10	14	18	21	31	13	04	34	-01	26	28	21	...								
25.	NEARES	82	05	-04	-17	-18	14	08	-08	14	26	28	18	24	40	14	24	26	-09	37	-15	26	17	27	19	...							
26.	METTO	-26	05	12	-06	12	-15	-32	32	-04	04	-07	-28	20	-35	06	-08	30	-09	-37	06	-31	-22	16	-15	-07	...						
27.	HIGHWA	50	-04	-22	-17	-07	05	-01	01	24	20	35	57	32	68	03	61	22	-09	55	-19	31	41	44	33	39	-08	...					
28.	EMPCAN	-10	-20	-04	-12	19	-18	-18	18	14	-22	-07	-13	33	-02	-03	26	-42	64	03	19	-07	02	-07	-04	-19	-03	-08	...				
29.	EMPSER	04	33	10	-13	-20	19	05	-05	20	30	20	20	-17	11	-06	-03	49	-54	17	-31	07	03	15	16	18	21	22	-55	...			
30.	PATERN	42	35	17	-53	03	-06	-03	03	55	59	80	31	42	48	10	58	-10	13	77	-53	65	70	46	24	35	-18	41	03	11	...		
31.	EMPSEX	-23	27	41	-16	-10	09	03	-03	-09	07	-19	-25	-02	-33	09	-37	-08	19	-43	00	-17	-25	-27	-30	-20	31	-43	-01	-06	-21	...	
32.	LEVRET	98	06	-08	-22	-14	12	08	-08	24	26	35	34	37	61	10	52	14	01	54	-18	37	32	33	25	83	-24	57	-07	04	45	-29	...

(Decimals Omitted)

Source: Gerald Hodge, op.cit., p. 18.

TABLE C

Measurement of Potential Growth Centers

Dimension	General Score Level for Potential Growth
Physical Development	High positive scores
French/English	High negative scores
Population Age	High negative scores
Industrial/Commercial Development	High negative scores
Population Size	High positive scores
Educational Level	High positive scores
Compact Development	High negative scores

Source: Gerald Hodge, op.cit., pp. 19-21; Table was developed from data presented in text of study.

REFERENCES AND FOOTNOTES - CHAPTER XII

[1]This chapter draws on data presented in the final report of the Commission on Population Growth and the American Future. See relevant references cited.

[2]U.S. Bureau of the Census, Statistical Abstract of the United States 1971, (92nd edition; Washington; Government Printing Office, 1971), Table No.1, p. 5

[3]Ibid., Table No. 3, p. 6.

[4]Ibid., Table No. 57, p. 48.

[5]The Commission on Population Growth and the American Future, Population and the American Future, (Washington; Galley Proof, 1972), pp. Galley 1-4 - 106.

[6]Ibid., p. Galley 1-6.

[7]U.S. Bureau of the Census, op. cit., Table No. 7, p. 10.

[8]Ibid., Table No. 5, p. 7, Series C projections.

[9]Number of children per family needed to achieve zero population growth (ZPG). Current statistics (Business Week, March 4, 1972) indicate that in certain reproductive cohorts (age groups) we are below this rate.

[10]The Commission on Population Growth and the American Future, op. cit., p. Galley 1-6.

[11]Ibid., p. Galley 1-7.

[12]U.S. Bureau of the Census, op. cit., reference 2, Table No. 17, p. 18; Based on existing metropolitan population base and rate of increase for series C projections to the year 2000.

[13]National Goals Research Staff, Toward a National Growth Policy: Population Distribution Aspects, Washington, D. C., March 1970, p. 17.

[14]Ibid., Chart 8, Note: The results of Pickard's study were included in the cited reference. For more detailed information see "Dimensions of Metropolitanism" by Jerome P. Pickard, Urban Land Institute, Washington, D. C., 1967.

[15]The Commission on Population Growth and the American Future, op. cit., p. Galley 2-6.

[16]U.S. Department of Agriculture, Economic Research Service, The Economic and Social Condition of Rural American in the 1970's - Part 1 (Washington: Government Printing Office, 1971), pp. 12 and 13.

[17]U.S. Bureau of the Census, op. cit., Table No. 18, p. 19.

[18]The Commission on Population Growth and the American Future, op. cit., p. Galley 2-11.

[19]Ibid., p. Galley 2-11.

[20]Ibid., p. Galley 3-4. Note: There is some discrepancy between the total poverty figures shown in the Commissions' report and relevant statistics from other sources. The total shown in the report does not equal the sum of its components. The sum does, however, agree with statistics from other sources.

[21]Ibid., p. Galley 3-4.

[22]Ibid.

[23]U.S. Department of Agriculture, Part 1, op. cit., p. 2.

[24]Lloyd Rodwin, Nations and Cities, Houghton Mifflin Company, Boston, 1970, p. 236.

[25]Ibid., pp. 241-242.

[26]Lowdon Wingo, "Issues in a National Urban Development Strategy for the United States," Urban Studies, Resources for the Future, 1972, p. 5.

[27]The President's National Advisory Commission on Rural Poverty, The People Left Behind (Washington: Government Printing Office, 1967), p. 93.

[28]Taken from Figure 14.

[29]U.S. Department of Agriculture, Economic Research Service, The Economic and Social Condition of Rural America in the 1970's, Part 3 (Washington: Government Printing Office, 1971), p. XII. This part presents an in-depth study by Dr. Fred Hines, of ERS into the Distribution of Federal Outlays Among U.S. Counties.

[30]United States Congress, Urban Growth and New Community Development Act of 1970, Title VII, Section 701.

[31]United States Congress, Agricultural Act of 1970, Title IX, Section 901(a).

[32]The 30 million people on farms in 1940 would have grown to 60 million under conservative natural increase assumptions and zero out-migration rates. The present rural farm population is less than 10 million. (See Wingo, op. cit., p. 43).

[33]The President's National Advisory Commission on Rural Poverty, op. cit., p. 143; Charles L. Schultze, et al., Setting National Priorities: The 1971 Budget, Brookings Institution, Washington, D. C. 1970, pp. 172-174.

[34]U.S. Department of Agriculture, Part 3, op. cit., pp. XII-XIII, 32-33.

[35]Ibid., p. XII, 21-24.

[36]Article, "The Land Boom at a Texas Airport," Business Week, March 11, 1972, pp. 116-117.

[37]Donald N. Rothblatt, Regional Planning: The Appalachian Experience, D. C. Heath and Co., Lexington, Mass., 1971, pp. 1-64.

[38]Lloyd Rodwin, op. cit., reference 25 at pp. 225-235.

[39]Ibid., pp. 227-228.

[40]Ibid., p. 228.

[41]Lowden Wingo, op. cit., pp. 24-41.

[42]Alfred Weber, Theory of the Location of Industries, trans. Carl J. Friedrich (Chicago and London: University of Chicago Press, 1929).

[43]Walter Izard, Location and Space Economy (Cambridge: The M.I.T. Press, 1956); General Theory: Social, Political, Economic, and Regional (Cambridge; the M.I.T. Press, 1969).

[44]National Water Commission, Population Growth in Communities in Relation to Water Resources Policy, Rivkin/Carson Inc., Washington, D. C., 1971, pp. 12-14.

[45]Walter Izard, Location and Space Economy, op. cit., p. 176.

[46]Ibid., p. 182.

[47]National Water Commission, op. cit., p. viii.

[48]Ibid, p. 20.

[49]Steven S. Fuller, Doctoral Thesis, 1969, p. 320.

[50]Charles L. Schultze et al., Setting National Priorities: The 1971 Budget, The Brookings Institution, Washington, D. C. 1970, pp. 94-96.

[51]Ibid., p. 95.

[52]Ibid, p. 98.

[53]Ibid, p. 98.

[54]Marion Clawson, American Land and It's Use, Resources for the Future, Inc., Washington, D. C., 1971

[55]John W. Reps, The Future of American Planning - Requiem or Renaissance, Cornell University: Center for Housing and Environmental Studies, 1967, pp. 47-48.

[56]Ibid., p. 53.

[57]Ibid, p. 53.

[58]Ibid, p. 54.

[59]Ibid, pp. 58-59.

[60]Charles L. Schultze et al., op. cit., pp. 55-160; Charles L. Schultze et al., Setting National Priorities: The 1972 Budget Brookings Institution, Washington, D. C., 1971, pp. 134-237.

[61]Ibid.

[62]U.S. Bureau of the Census, op. cit., reference 2.7, Table No. 612, p. 397.

[63]The terms rural area and non-metropolitan cities refer to areas having a density of less than 100 persons per square mile and cities having a total population of less than 50,000, respectively.

[64]United States Congress, Senate Committee on Agriculture and Forestry. Revenue Sharing Program for Rural Development. Hearings before Subcommittee, 92d Congress 1st Session, on S. 1612, April 23; April 29; May 3 and 4; June 16 and 17; July 8 and 9, 1971. (Washington: Government Printing Office, 1971).

[65]U.S. Bureau of the Census, op. cit., reference 2, Table No. 1, p. 5.

[66]Gerald Hodge, The Identification of Growth Poles in Eastern Ontario, a study for the Ontario Department of Economics and Development, Toronto, 1966.

[67]Ibid, p. 17.

BIBLIOGRAPHY

Advisory Commission on Intergovernmental Relations (ACIR), Multistate Regionalism, Report A-39, ACIR, Washington, D. C., 1972.

Advisory Commission on Intergovernmental Relations (ACIR), Urban America and the Federal System, Report M-47, ACIR, Washington, D. C., 1969.

Bilder, Richard B., Controlling Great Lakes Pollution: A Study in United States-Canadian Environmental Cooperation, Michigan Law Review, Vol. 70, No. 3, January 1972, pp. 469-556.

Bloomfield, L.M. and Gerald F. Fitzgerald, Boundary Waters Problems of Canada and the United States (The International Joint Commission 1912-1958), The Carswell Company, Ltd., Toronto, 1958.

Bosselman, Fred and David Callies, The Quite Revolution in Land Use Control, report prepared for the Council on Environmental Quality, GPO: Washington, D. C., 1971.

Committee for Economic Development (CED), Modernizing Local Government: To Secure a Balanced Federalism, CED, 477 Madison Ave., New York, N.Y. 10022, July 1966.

Craine, Lyle E., Final report on Institutional Arrangements for the Great Lakes, a report prepared for the Great Lakes Basin Commission, March 15, 1972.

Craine, Lyle E., Institutions for Managing Lakes and Bays, in Natural Resources Journal, Univ. of New Mexico School of Law, Vol. 11, No. 3, July 1971.

Dworsky, Leonard B. (ed.), Canadian-United States Water Resources Problems and Policies, Water Resources and Marine Sciences Center, Cornell Univ. Ithaca, New York. Publication No. 11, 1966.

Dworsky, Leonard B., The Relationship Between the United States and Canada, in proceedings of the Seminar on the Continental Use of Arctic-Flowing Rivers, held in Pullman, Washington from April 1 to May 20, 1968. Proceedings published by The Wenatchee Daily World, Wenatchee, Washington, 1968.

Erichson-Brown, J.P., Legal Implications of Boundary Water Pollution, 17 Buffalo Law Review 65 (1967).

Etzioni, Amitai., Authority Structure and Organizational Effectiveness, Administrative Science Quarterly, Vol. 4, pp. 43-67, June 1959.

Fesler, James W., National Water Resources Administration, in Economics and Public Policy in Water Resources Development, Iowa State Univ. Press, Smith & Castle (eds.), 1964.

Fox, Irving K. and Lyle E. Craine, Organizational Arrangements for Water Development, in Natural Resources Journal, Univ. of New Mexico School of Law, Vol. 2, No. 1, April 1962.

Freeman, A.M. and R.H. Haveman, Water Pollution Control, River Basin Authorities, and Economic Incentives: Some Current Policy Issues, in Public Policy, Harvard Univ. Press, Vol. XIX, No. 1, p. 53, Winter 1971.

Frenette, Roger E., A Water Quality Management Strategy for the Great Lakes, M.S. Thesis, School of Civil & Environmental Engineering, Cornell Univ., Ithaca, N.Y., 1971.

Great Lakes Basin Commission, Great Lakes Basin Framework Study, Appendix No. 20, Federal Law, Policies and Institutional Arrangements, June 1971.

Great Lakes Water Quality Board, Great Lakes Water Quality, annual report to the International Joint Commission, April 1973.

Griffin, William L., A History of the Canadian-United States Boundary Waters Treaty of 1909, 37 University of Detroit Law Journal 76 (1959-1960).

Grodzin, Morton, The American System: A New View of Government in the United States, Rand McNally, Chicago, Ill., 1966.

Haefle, Edwin T., Environmental Quality as a Problem of Social Choice, Proceedings of Conference on Environmental Quality and the Social Sciences: Theoretical and Methodological Studies, June, 1970, Resources for the Future.

Hargrove, John L. (ed.), Law, Institutions, and the Global Environment, papers and analysis of the proceedings of the Conference on Legal and Institutional Responses to Problems of the Global Environment, Arden House, Harriman, New York, September 1971. Oceana Publications Inc., Dobbs Ferry, N.Y., 1972.

Hart, Gary W., Institutions for Water Planning, Report prepared for the National Water Commission, Arlington, Va., 1971.

Hart, Henry C., Crisis, Community, and Consent in Water Politics, in Law and Contemporary Problems, Water Resources, School of Law; Duke Univ., Vol. XXII, No. 3, Summer 1957.

Hart, Henry C., The Dark Missouri, Univ. of Wisconsin Press, 1957.

Heeney, A.D.P., Along the Common Frontier: The International Joint Commission, pamphlet prepared for the Canadian Institute of International Affairs, Vol. XXVI, No. 5, 1967.

International Joint Commission, Pollution of Lake Erie, Lake Ontario and the International Section of the St. Lawrence River, A report to the IJC by the International Lake Erie Water Pollution Board and the International Lake Ontario-St. Lawrence River Water Pollution Board, 3 volumes, 1969.

Jordan, Frederick J.E., Recent Developments in International Environmental Control, 15 McGill Law Journal 279 (1969).

Kneese, Allen V., Strategies for Environmental Management, in Public Policy, Harvard Univ. Press, Vol. XIX, No. 1, p. 37, Winter 1971.

Krutilla, John V., Is Public Intervention in Water Resources Development Conducive to Economic Effeciency?, in Natural Resources Journal, Univ. of New Mexico School of Law, Vol. 6, No. 1, January 1966.

Krutilla, John V., The Columbia River Treaty: The Economics of an International River Basin Development, Resources for the Future, Inc., The Johns Hopkins Press, Baltimore, Md., 1967.

Maass, Arthur, Area and Power, The Free Press, Glencoe, Ill., 1959.

Maass, Arthur, et al., Design of Water-Resource Systems, Harvard Univ. Press, 1962.

Martin, Roscoe, et al., River Basin Administration and the Delaware, Syracuse Univ. Press, 1960.

MacNeill, J.W., Assumptions Made by the Canadian Government in Establishing Strategies for Environmental Quality Improvement, paper presented to The Atlantic Council of the United States Conference on "Goals and Strategies for Environmental Quality Improvement in the Seventies." January 1971.

MacNeill, J.W., Environmental Management, Constitutional Study prepared for the Government of Canada, Ottawa, 1971.

MacCallum, J.L., The International Joint Commission, in the Canadian Geographical Journal, Vol. LXXII, No. 3, March 1966.

McCallum, G.E. and L.B. Dworsky, Great Lakes Development Program - Review and Prospects, Great Lakes Research Division, Pub. No. 11, The Univ. of Michigan, 1964.

Merchant, Livingston T. and A.D.P. Heeney, Canada and the United States - Principles for Partnership, Department of State Publication 7940, August 1965, GPO, Washington, D. C.

Morgan, Robert J., Pressure Politics and Resources Administration, Journal of Politics, Vol. 18, pp. 39-60, February 1956.

Office of Science and Technology (OST), Water Resources Policy and Political Institutions, GPO, Washington, D. C., 1969.

Ostrom, Vincent, Institutional Arrangements for Water Resource Development, report prepared for the National Water Commission with special reference to the California water industry. Report No. NWC-SBS-72-034, December 1971.

Ostrom, Vincent, et al., Problems for Institutional Analysis of the Great Lakes Basin. Proceedings of the Thirteenth Conference on Great Lakes Research, Buffalo, N.Y., April 1970.

Pealy, Robert H., Organization for Comprehensive River Basin Planning, The Univ. of Michigan, Michigan Government Studies, No. 46, The Institute of Public Administration, Ann Arbor, 1964.

Piper, Don C., The International Law of the Great Lakes, Publication No. 30, Duke University Commonwealth-Studies Center, Duke Univ. Press, Durham, N.C., 1967.

Republican House Members' Report on United States-Canadian Relations, Congressional Record, September 28, 1965, pp. 25394-25401.

Roberts, Marc J., Organizing Water Pollution Control: The Scope and Structure of River Basin Authorities, in Public Policy, Harvard Univ. Press, Vol. XIX, No. 1, p. 75, Winter 1971.

Roberts, Marc J., River Basin Authorities: A National Solution to Water Pollution, Harvard Law Review LXXXII, pp. 1527-1556, May 1970.

Selznick, Philip, TVA and the Grass Roots - A Study in the Sociology of Formal Organization, Univ. of California Press, Berkeley and Los Angeles, 1949.

Sewell, W.R. Derrick, et al., Water Management Research: Social Sciences Priorities, Policy and Planning Branch, Dept. of Energy, Mines and Resources, Ottawa, 1969.

Stein, S.B., Environmental Control and Different Levels of Government, International Symposium on Environmental Disruption, Tokyo, Japan, March 1970.

Thompson, James D., Approaches to Organizational Design, Univ. of Pittsburgh Press, 1966.

Thompson, James D., Organizations in Action, McGraw-Hill Book Co., New York, 1967.

Water Resources Council, Alternative Institutional Arrangement for Managing River Basin Operations, Washington, D. C., August 1967.

Waite, G. Graham, The International Joint Commission - Its Practice and Its Impact on Land Use, 13 Buffalo Law Review 93 (1963).

Weber, Eugene W., Functions of the International Joint Commission, 94 J. of Power Division, Proc. of Am. Soc. Civil Engineers 177, Nov. 1968.

Weber, Eugene W., Activities of the International Joint Commission, United States and Canada, 31 Sewage and Industrial Waste 71 (1959).

Welsh, Matthew E., Role of the International Joint Commission, Eng. Inst. of Canada and Am. Soc. Civil Engineers, Proceedings of the Great Lakes Water Resources Conference, 1969, Toronto.

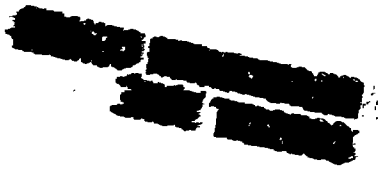
Wengert, Norman, The Politics of River Basin Development, Law and Contemporary Problems, River Basin Development, Duke Univ. School of Law, Vol. XXII, No. 2, Spring 1957.

White, Gilbert F., Formation and Role of Public Attitudes, in Environmental Quality in a Growing Economy, Resources for the Future, Johns Hopkins Press, H. Jarrett (ed.), Baltimore, 1966.

White, Gilbert F., Strategy of American Water Management, The Univ. of Michigan Press, 1969.

Wilson, James A., Innovation in Organization: Notes Toward a Theory in Approaches to Organizational Design, Univ. of Pittsburgh Press, James D. Thompson (ed.), Pittsburgh, Pa., 1966.

Zimmerman, F.L., Intergovernmental Commissions: The Interstate-Federal Approach, in State Government, Vol. 42, Spring, 1969.



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