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SHORE-ZONE REPORT

Shore-Zone Report No. 2
September 1981

Environmental Conservation Service
Environment Canada
Ottawa, Ontario

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SHORE-ZONE REPORT1. INTRODUCTION

This publication marks the second of a series of Shore-Zone Reports which will provide a regular source of information on shore-zone activities in Canada.

The Report series has been designed to:

- i) provide an update on the status of shore-zone initiatives and concerns;
- ii) present information on new methodologies;
- iii) help speed technology transfer.

The Report is also intended to increase awareness of Environment Canada's activities and responsibilities as they relate to shore-zone management. It is also directed to federal, provincial and municipal departments concerned with shore-zone management. The information presented may also be of interest to private groups and individuals who are concerned with management activities in the Canadian shore zone.

Any questions regarding specific regional activities described, should be addressed to the co-ordinator(s) listed below:

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Should you require additional copies of the Shore-Zone Report, please contact Dr. Michael Parkes or Mr. Chris Hanlon at the above address.

2. HIGHLIGHTS

- The Canadian Wildlife Service (Atlantic Region) in cooperation with the provinces have been mapping and classifying wetlands in the region. Mapping of freshwater wetlands has already begun and work on saltwater wetlands will commence in the near future.
- A report summarizing the five years of erosion monitoring in the Great Lakes is scheduled for completion by October 1981. Slide-tape presentations have been prepared and are available through the Ontario Regional IWD office.
- The Joint Canadian Environmental Advisory Councils have indicated that they fully support the principles of Shore-Zone Management agreed to by the Canadian Council of Resource and Environment Ministers (CCREM).
- The NRC Associate Committee for Research on Shoreline Erosion and Sedimentation (ACROSES) is preparing a compendium of related shore-zone research papers.
- The selected Shore-Zone Statistics Section notes that as of December 31, 1981 total of approximately 1,450 Canada Oil and Gas permits involving about 41.4 million hectares were held off Canada's east and west coasts and in the Hudson Bay Region.
- Canada is participating in a six-nation NATO study of estuary management problems.
- The Canadian Association of Geographers has formed a Special Study Group on Marine Studies and Coastal Zone Management.
- The East Coast offshore hydrocarbon development conference in St. John's, Newfoundland attracted over 200 participants.
- A study on the applicability of Scottish and Alaskan offshore oil and gas experience to the Canadian Beaufort Sea has been completed.
- The Province of Nova Scotia has announced a new program to study coastal erosion.

3. HEADQUARTERS ACTIVITIES

A) NATO/CCMS Estuary Management Study

Canada is one member of a six-nation NATO team studying planning and management of selected major estuaries. The National Coordinator, Shore-Zone Program was appointed as Canadian representative to this study, and has continued work on the Canadian contribution. Meetings of the Study Working Group were held in Annapolis Md. and in the Netherlands. A report on the Fraser estuary was produced jointly with regional DOE officials and those of the Province of British Columbia's Ministry of Environment. A more complete description of the study follows in Section 5-B (International). The NATO Study is scheduled for completion in October 1981.

B) The National Research Council Associate Committee for Research on Shoreline Erosion and Sedimentation (ACROSES)

A special link exists between the DOE Shore-Zone Program and ACROSES. The National Coordinator, Shore-Zone Program sits on this Committee, which is chaired by the Chief of Hydrology of the National Water Research Institute (NWRI). This Committee met twice in 1980-81 in Winnipeg and Quebec. Its terms of reference are:

1. To promote, on a national basis, research into processes affecting movement of nearshore coastal sediments and into the mechanisms of sediment transport.
2. To identify needs and priorities for research into the nearshore zone in Canada.
3. To promote, on a national basis, research into means of reducing or preventing erosion of the nearshore zone and the evaluating of existing means.
4. To promote, on a national basis, research into means of reducing or preventing accretion of harbours and navigable channels located in the nearshore zone and the evaluation of existing means.
5. To promote communication in the field of research into nearshore processes in Canada by encouraging:
 - i) the preparation of manuals for engineering purposes;
 - ii) the publication of established journals of research work in Canada; and
 - iii) the organization by existing bodies of seminars and conferences on nearshore processes in Canada.

During the period 1980-1981 the Committee published the following material related to nearshore processes:

1. Short Course Lecture Notes, Basic Nearshore Processes (April, 1980).
2. Proceedings of the Canadian Coastal Conference 1980 (April, 1980).
3. English-French Glossary of Shoreline Erosion and Sedimentation Terms (May, 1980).
4. ACROSES/CARERE Bulletin (November, 1980).

Information on these publications is available through the ACROSES Committee Secretary, Mr. D. H. Willis, Hydraulics Laboratory, Division of Mechanical Engineering, National Research Council of Canada, Ottawa, Ontario K1A 0R6.

C) International Ocean Institute and Dalhousie University Training Programme

The Dalhousie University Centre for Foreign Policy Studies and the International Ocean Institute of Malta held a training programme in marine resources management in Halifax, Nova Scotia, June 10 to August 21, 1981. Resource managers and senior officials from some 17 countries attended, including representatives of the Peoples Republic of China, as well as various Caribbean, African and South American countries. About 50 specific subjects were covered relating to the management of the Exclusive Economic Zone (EEZ). Presentations of the Canadian viewpoint were made by officials from a number of federal Departments, including the National Coordinator, Shore-Zone Program, DOE. Further information on this Programme can be obtained by contacting Dr. Elizabeth Mann Borgese, c/o Department of Political Science, Dalhousie University, Halifax, N.S. B3H 4H6.

4. REGIONAL ACTIVITIES

A) Atlantic Region

1. Lands Directorate is involved in a coastal classification mapping project for the Avalon and Burin Peninsulas of Newfoundland. The classification consists of two components:
 - i) An ecological land survey of a two kilometer coastal strip on the two peninsulas in which vegetation, present land use, terrain and soils are classified (the soils are classified with respect to their capacity for engineering uses).
 - ii) A linear classification of the coastline with emphasis on those characteristics which determine sensitivity to oil pollution.

The ecological land survey information will assist in planning onshore developments resulting from offshore oil exploration and production. The coastal classification is being used by Woodward-Clyde Consultants on behalf of Mobil Oil to develop an oil spill countermeasures plan for the area.

This year the coastal classification and mapping has been extended, with the co-operation of Petro Canada, to cover the northeast coast of Newfoundland from Bull Arm to Cape Bauld. Field work for this project is now underway.

2. In co-ordination with the south eastern Newfoundland mapping project described above the Environmental Protection Service has produced a coastal sensitivity atlas (at 1:350,000 scale) of the same area. Parameters included in the atlas are oceanographic features, geomorphology, meteorological data, important recreation areas, marine biological resources, salt water dependent industries, and fixed fishing gear. Protective countermeasures against oil spills are also proposed including oil containment and cleanup strategies for the coastal zone using information such as distances between potential cleanup sites, major settlements, air strips, etc.

The atlas has been recently published and inquiries should be directed to Mr. H. Hall, Director, Marine Protection and Assessments Branch, EPS, 5th Floor, 45 Alderney Drive, Dartmouth, Nova Scotia - B2Y 2N6.

3. The Inland Waters Directorate has entered into flood damage reduction agreements with Nova Scotia and New Brunswick. Subsidiary agreements cover flood risk mapping studies with alternatives for development that would reduce flood damage. In addition, a recently signed pilot agreement addresses flood risk mapping projects in two coastal areas of Newfoundland.

4. A project to develop an interdepartmental report on the quality of the ocean environment has been initiated in the Atlantic Region. A meeting, chaired by Mr. B. Wilson of the Environmental Protection Service and attended by representatives from various DOE services, DFO, MOT, and the Atlantic Geoscience Centre was held to begin developing the contents and scheduling of the report. Present planning calls for the report to be completed by the fall of 1982.
5. Over the past year a new national program for Wetland Protection, Mapping and Designation was inaugurated. Under the auspices of this program, CWS Atlantic, in co-operation with the provinces, has begun mapping and classification of wetlands in the Atlantic Provinces. Work has commenced on the mapping of fresh water wetlands in Nova Scotia and PEI and salt water wetland will be this fiscal year.

CWS Atlantic is also updating its computerized information on seabird observations over the past 10 years. After this update is completed, information will be retrievable on a coastal unit basis.

B) Quebec Region

1. Meeting on St. Lawrence River Shoreline Management

The minutes of the meeting on St. Lawrence River Shoreline management (see Shore Zone Report No. 1) have been forwarded to all participants for comment. The final version should be completed shortly.

2. Kamouraska Wetlands Reclamation

The Ministère de l'agriculture, des pêcheries et de l'alimentation du Québec (Quebec Department of Agriculture, Fisheries and Food) decided in 1979 to build dykes in the Kamouraska marshlands in order to reclaim land for agricultural purposes. Several federal and provincial departments have since opposed the destruction of these marshlands, which are a privileged wildlife habitat and play a significant role in maintaining the balance of the St. Lawrence estuary.

At present, the conservation of the Kamouraska wetlands is apparently well on the way to being achieved.

Moreover, Fisheries and Oceans Canada will undertake research on the importance of these wetlands as a fish habitat; this research is slated to begin in the spring of 1981.

3. Harnessing of Lower North Shore Rivers

A research team has been set up to assess the impacts of harnessing the rivers of the Lower North Shore. Known as the

ARIES study group (Aménagement des rivières et impact sur les eaux salées -- River development and impact on salt water), the team will study the impact of hydroelectric development of rivers of biological productivity (including fisheries), ice formation and the marine climate of the northern Gulf of St. Lawrence. The team comprises representatives of Hydro-Quebec, the James Bay Energy Corporation, the Quebec Government, Quebec universities and of Fisheries and Oceans Canada.

4. Marshland Losses Along the St. Lawrence

The Canadian Wildlife Service and the Lands Directorate will undertake an inventory of marshland losses over the past 40 years between Cornwall and Matane on both the south and north shores. This project should be completed in the spring of 1981.

C) Ontario Region

1. Great Lakes Shore Management

A five year agreement amongst Ontario Ministry of Natural Resources and the Departments of Environment and Fisheries and Oceans, for the funding through the Canada Water Act of shore erosion monitoring and public awareness promotion along the Great Lakes has come to an end. DFO and OMNR have agreed to continue funding a reduced erosion monitoring program on a year-to-year basis, and all three agencies will continue to support public awareness. A report on the five years of erosion monitoring is scheduled for completion by October, 1981.

Two slide-tape shows prepared under the public awareness program are now available on free loan for a short period of time, or for purchase. The shows explain the shore processes responsible for flooding and erosion, and discuss information sources available to a prospective property owner. Illustrated scripts of the two shows are also available.

2. International Lake Erie Regulation Study

Reports on the environmental and shore damage effects of regulating the water levels of Lake Erie have been completed and will be available for distribution in September, 1981.

D) Western and Northern Region

1. Beaufort Sea

The department has established a Beaufort Sea Project Office in Edmonton with Mr. Gerry Fitzsimmons as Project Manager. Mr. Fitzsimmons will provide a focal point for environmental

issues, including the EARP Panel review, for hydrocarbon development, production and transportation and their potential impacts on the shore-zone areas of the Beaufort Sea.

Under the Baseline Studies Program, the Lands Directorate is compiling existing bio-physical information for the Beaufort Sea shore zone and adjacent areas. When the project is completed, this information will be available on a 1:500,000 scale through the Canada Land Data System for impact assessment, regional planning and site evaluation.

2. Arctic Shipping: Parry Channel and Baffin Bay

An Environmental Advisory Committee, co-chaired by DFO and DOE, will advise the newly established Arctic District of the Coast Guard on all environmental aspects of shipping in the Arctic. This includes shore-zone issues associated with the LNG tankers and the Arctic Pilot Project.

E) Pacific and Yukon Region

The Canada-British Columbia Fraser River Estuary Agreement

This federal-provincial agreement was signed in October, 1979 calling for the following features:

- i) the organization of a dialogue among government, industry and the public concerning the future of the estuary;
- ii) the organization of research and monitoring programs to support the management plan;
- iii) the completion of an area designation process to provide a basis for coordinated administration of the estuary;
- iv) the establishment of an information clearinghouse centered in the Vancouver region for the dissemination of information relating to the development and use of land and water resources within the estuary.

Under the agreement, a Planning Committee was established consisting of 12 members, with an equal number appointed by the federal and provincial governments. The British Columbia Ministry of Environment chairs the committee and the federal Department of Environment (Environment Canada) is Vice-Chairman. Also, on the Committee are representatives of other federal departments and agencies including the Harbour Commissions and National Harbours Board; the Department of Public Works; the Department of Fisheries and Oceans; and the provincial Ministeries of Lands, Parks and Housing; Municipal Affairs; and Industry and Small Business Development. As well, there is a representative of the Regional Districts.

The budget for the 1980-81 fiscal year is \$190,000 (Can.), cost-shared equally between the federal and provincial levels. As most of this money is used to support a coordinator's office, the agreement assumes significant levels of staff support from participating agencies. Total cost of the original agreement was \$300,000 (Can.), but supplementary funding has been requested. Several federal-provincial-regional task forces have been established to coordinate program activities: an area designation task force; a referrals improvement committee; a management systems sub-committee; and an information clearinghouse task force.

A public participation program has also been initiated in conjunction with this planning phase. A public advisory group, public information bulletin and consultation, area designation meetings and general publicity surrounding the process are also included in budget estimates. Central to the public participation program is the Fraser Estuary Forum (FREF). The Fraser Estuary Form provides a formal organizational base for a whole spectrum of community and special interest groups to become involved. Meetings are open to the public. FREF serves as a public monitor of the study process and provides resources to groups and individuals to become more effectively involved in the Study.

The Agreement is scheduled to terminate in late 1981, but a request for extension has been proposed. At the end of the first agreement, it is hoped that an Implementation Agreement can be negotiated based on the results obtained.

Several task forces and committees have been created to aid the Planning Committee. Their work to date is summarized below.

1. The Area Designation Task Force

The Area Designation Task Force continues to work on the presentation of agency views on best use of the estuary. The task force is attempting to link the area designations to the plans of key management agencies in the foreshore and to municipal and regional district plans on adjacent upland. This is being accomplished by preparing land and water use suitability maps, gathering available information on resource capabilities and uses, and developing site-specific management guidelines. A first draft of an Area Designation map and supporting documents were completed and circulated for review in June 1981.

2. The Referrals Improvement Sub-Committee of the Planning Committee

The role of the Referrals Improvement Sub-Committee of the Planning Committee is to review the various referrals systems of agencies on the estuary and to recommend or experiment with improvements. This is being accomplished through detailing existing inter-agency approval processes in the estuary, identifying deficiencies in the generation and distribution of

management information respecting proposed developments in the estuary, developing proposals for coordinating and consolidating approval processes, and identifying the data base required for the information clearinghouse.

3. The Management Systems Sub-Committee of the Planning Committee

The Management Systems Sub-Committee's function is to undertake work leading to proposals for a management system and plan. It is currently guiding the work of the study in developing proposals for a linked inter-agency management process and plan, evaluating management proposals, and undertaking case studies to evaluate management alternatives.

4. The Information Clearinghouse Task Force

The role of this task force is to address the problem of estuary related information collection, integration and dissemination in the management process. It has been decided to delay this activity until the management proposals are further developed and the management information requirements to implement and update the plan have been identified.

5. Public Advisory Activities

A public involvement program has been designed which will involve interested public groups and individuals in the study process. 'Checkpoints' throughout the study ensure that there will be regular and effective opportunities for the public (and agencies) to review and comment on major study reports and proposals. The key activities in the program include a study newsletter, interviews, community workshops, and public meetings. These activities are an opportunity for open discussion between citizens of the communities bordering the Fraser River and the members of study committees, task forces and planning staff.

The public advisory group (the Fraser River Estuary Forum) is monitoring all the activities of the study to ensure that an open process is maintained and that the views of organized public interest groups are understood and responded to by the study. Regular meetings have been held which are open to the public.

A review of management options for the Fraser has concluded that the super-agency approach would not be feasible. Apart from practical questions concerning the size of such a body or how it would fit into the existing framework, the super-agency approach might prevent agencies from taking early action on present problems because of the uncertainty involved. Rather, the concept of linking several plans of key agencies together is being followed. Policy guidelines are being developed to enable existing plans to be dove-tailed, and new plans formulated. The challenge is to adjust the current pattern of decision-making to a longer-term, collective strategic framework that avoids unnecessary confrontation.

5. CONFERENCES AND MEETINGS

A) National

Conference Report - Offshore Environment in the 80's, St. John's, Newfoundland, December 2-4, 1980

The theme of this conference was to review environmental considerations of East Coast offshore hydrocarbon development. Held in St. John's, the conference was co-sponsored by the Canadian Petroleum Association, the East Coast Petroleum Operators Association, the Institute for Cold Ocean Science, Memorial University, the Newfoundland Department of Consumer Affairs, the Nova Scotia Department of the Environment and Environment Canada. About 200 people attended the sessions.

The Conference was opened by the Honourable Ron Dawe, Newfoundland's new Minister of Environment. The Province of Newfoundland is re-organizing itself to cope with the coming onshore development, and has passed a new Environmental Assessment Act which appears to dovetail with the federal Environmental Assessment and Review Process (EARP). Some 20 areas of coastline have been frozen for development purposes and any major oil-related projects within them must have Ministerial approval before they can go ahead. A new Water Resources Act has also been passed to develop better information for water resource planning purposes. The Province is most concerned about the rate and timing of oil-related development and is determined to avoid a boom/bust syndrome.

The Offshore Petroleum Directorate was established to coordinate provincial contact with the oil companies. It is a small, highly specialized unit that provides advice to the Province mainly in terms of economic analysis. The Offshore Petroleum Interdepartmental Committee (OPIC) oversees interdepartmental coordination specifically related to onshore development in support of future hydrocarbon production.

Dr. Clint Edmonds, DOE Regional Director General, Atlantic region, then outlined some of the federal activities in the environmental field on the east coast. He spoke of the progress in industry-government cooperation regarding the Offshore Labrador Biological Studies (OLABS) and the Eastern Arctic Marine Environmental Studies (EAMES) programs. In addition, there is work either directly or indirectly funded related to bio-physical phenomena such as icebergs, bird populations, and fisheries. He noted, however, that there was a lack of focus to consider environmentally-related activities, and that this conference was an attempt to provide direction in this area.

The papers given in the subsequent sessions covered a considerable variety of topics. Dr. D.F. Sherwin of EMR Ottawa gave an excellent background paper on the geological setting for offshore hydrocarbon exploration. According to Sherwin the most

geologically promising oil-bearing structures after those located at Hibernia are in Baffin Bay. In his opinion, this is the most likely area of future activity. The Sable Island structures have just produced gas thus far. Hudson Bay appears to be a "non-starter" for oil geologically speaking.

Mr. Steve Romansky, Manager of East Coast Operations for Mobil Oil then provided a brief description of hydrocarbon development proposals for the East Coast. Progress to establish commercial reserves of Sable Island is steady. Over 2 trillion cubic feet of gas reserves have been proven. Three trillion cubic feet are needed for commercial production. Drilling this year has been concentrated at the Venture D-23 well. There are two alternatives for bringing the gas ashore. The first is liquifaction on site and shipment by LNG tanker, the second is removal in the raw state and pipelining. The second alternative (a pipeline system and processing on the mainland) is economically preferable.

On the Grand Banks, the P-15 well has shown 800-3800 bbls/day and a 300 foot oil pay zone. South Tempest G-55 is now being drilled with a semi-submersible rig. Mr. Romansky outlined a range of alternatives for production, including concrete and steel platforms, floating production (by specially designed ships or semi-submersible vessels, semi-submersible platforms and submersible platforms). Any of these alternative modes will have to be able to withstand water depths of 270-300 feet, pack ice (estimated as occurring 10 in every 16 years), fog (a considerable navigational hazard), icebergs, and 100 year design waves of 100 feet. Risk estimates now show that the probability of an iceberg hit for a fixed platform is 1 hit for each 4-8 years in place.

Dr. Steven Millan, Executive Director, Newfoundland Offshore Petroleum Directorate followed Mr. Romansky. He estimated that there is now a 50 percent probability of 10 billion barrels recoverable for the whole of Newfoundland offshore and a 50 percent probability of a 1 billion barrel plus reserve at Hibernia.

The evening was closed by Mike Fenwick, former planning director of the Zetland County Council in the Shetland Islands. He gave an overview of the Shetland experience in terms of accommodating major oil and gas development on their own terms.

The second day was devoted to a description of the marine ecosystem in the Atlantic Region. Papers were presented by Dr. Paul Brodie of the Bedford Institute of Oceanography (BIO), Dr. Rod Brown Canadian Wildlife Service (CWS) and Sandy Sandeman Fisheries and Marine Service (FMS), St. John's. These papers outline the basic structure of East coast marine ecology including a description of food chains, predator/prey relationships and the attempts by man to "manage" the fish stocks. The dramatic changes in fish numbers are not necessarily related to our catch restrictions. Accurate population predictions for size and movement have been difficult.

The potential impact of hydrocarbon development on existing coastal and community relationships was the topic of the next session. Speakers read papers devoted to the influence of such development on fishing activities and gear. Fear was expressed of the debris problem caused by oil platform and pipeline construction offshore. Fish nets and gear can easily be fouled or cut by pipeline trimmings such as has been encountered in the North Sea. The possible impacts of development on indigenous labour pools were noted. While there is no major problem foreseen for skilled masters and captains (they can move between both industries with relative ease), there is a question concerning the loss of semi-skilled and unskilled workers to the oil industry in the construction phase, and its effect on inshore and fish processing industries.

The evening session of day 2 was devoted to coastal zone management on the East Coast. From the papers presented it is clear that a major weakness is evident in this area. Neither Newfoundland nor Nova Scotia have in place a systematic program of coastal zone planning or management. Few preparations have been made to integrate land-based and marine-based systems for planning purposes. Strategic planning at the coast is on an ad hoc basis only and no federal-provincial joint plans have been formulated as yet. One paper of particular interest was that of Dr. Stephen Olsen of the Coastal Resource Centre at Rhode Island, who gave a brief overview of American experience in the field. While federal-state cooperation in the CZM program has not been uniform, there have been some successes in establishing good management models, notably in California and Rhode Island.

The session on Day 3 concerned oil pollution in the marine environment. Papers were presented by Dr. David Topham, Department of Fisheries and Oceans (DFO) (Pat Bay), Dr. David Scarrat, DFO (St. Andrews), Dr. Ed Owens, Consultant, Dr. Shawn Gill (Coast Guard), Dr. Don Mackay, University of Toronto and Mr. Peter Blackhall of Environment Canada. While there is much public concern over any kind of oil spill, the speakers were most concerned about the impact on shorelines. There, the greatest number of species are likely to be affected that are most sensitive to a spill. Not the least of these problems is the effect of a spill on recreational property values. The unpredictability of oil spills in terms of amount, kind of oil, season and timing make developing counter-measures very difficult. Booms with skirts are useless with longshore currents or tides of more than 1.3 m/sec As the oil is simply drawn beneath the booms. Dr. Mackay of the University of Toronto is very supportive of chemical dispersants - he described both the benefits (speeding up dispersion) and costs (toxicity or tainting of fish and other marine life in larger areas) of dispersant application. Mackay noted that oil slicks drift at 3 percent of windspeed, depending on the ocean currents in the area, and have a lifetime of from 2 to 20 days (depending on the natural dispersion rate). Slicks have a 50 percent probability of moving 200 km in 8 days. Clean-up expenditures are presently averaging about \$1,000 per barrel, but this figure would probably be much

higher for colder regions. The key is to avoid shoreline contamination. Mackay predicted that in the worst case scenario, the spill from a major blow-out at Hibernia would take 10 days to reach the Newfoundland coastline.

The final session involved a series of workshops that revolved around four issues:

- i) What are the concerns for the environment in relation to offshore development?
- ii) What additional information about the environment and offshore development activities is needed?
- iii) What aspects of offshore development and the environment should be monitored over the lifetime of the developments?
- iv) What measures should be taken to protect the environment and socio-economic interests from the potential impacts of offshore development?

Regarding issue i), the workshop groups found that the important concerns were: (a) oil spills and blowouts (including the effects of small spills); (b) the effects of drilling muds and pipe cuttings on fisheries; (c) the disturbance of oil-related development to fishing grounds (including the displacement of fishermen); (d) whether and how compensation can be arranged for disturbance; (e) the problem of marine traffic and navigation in development of the fields; (f) social concerns (including substitution effects from loss of skilled labour to the oil industry); and (g) the lack of knowledge of biological oceanography. The main theme running through the work groups on this issue was the lack of adequate information in order to make reasonable decisions by scientists, businessmen and the general public. Trade-offs were seen as inevitable, but without more relevant information, the disparity between real and imagined concerns by the public and politicians will be increased dramatically.

With respect to issue ii), the groups felt that there was not enough relevant information about the ocean and nearshore environment being produced or proper access provided to those interested. There was a call for better coordination of information gathering, abstracting and analysis, especially between federal and provincial government agencies. It was felt that the oil companies should handle only those parts of environmental problems that directly affect safety. Better information on waves and currents, ice, hindcast modelling, and oil spill trajectory models were needed. There was a call for more information on sensitive habitats such as the distribution of fish larvae and juveniles in the area likely to be affected, or bird colony sites. Baseline studies on iceberg and pack ice behaviour were needed, as were studies on the fate of contaminants and toxic chemicals. There was

also a strong need voiced for clarification of the legislation regarding jurisdiction. More geological information was needed on the continental shelf, especially in light of the 1929 Grand Banks earthquake (it measured 7.2 on the Richter Scale).

Regarding issue iii), there was a need to identify kinds of measure that can be used to detect ecological changes. A question was raised as to who will monitor the impacts of drilling muds or debris resulting from the construction phase. There was a call for a joint government-industry body to accomplish this task.

On issue iv), there was a disagreement about the implications of its wording. Not all impacts will be deleterious. Whatever happens, the federal-provincial differences must be resolved urgently, and there must be a coordination between the two levels in finding solutions to overlapping concerns. There is a high priority for public education and information and local communities must be involved. This should begin early, and it was stressed that planning at the local level was critical. The working groups underlined the necessity for long-range strategic plans to secure the long-term future of other natural resources when the oil runs out. A permanent interface between the fishing and oil interests should be created, and policies at both the federal and provincial levels should be developed in this area. The current lack of overall direction among government agencies at both levels was noted especially in setting goals and objectives. Current planning procedures must be overhauled.

In summary, the conference was well worthwhile, and focussed attention on some critical areas concerning the East coast oil play that deserve immediate attention by both federal and provincial governments. Adequate resource planning and relevant advance information on oil development was singled out as a fundamental need.

Canadian Association of Geographers Annual Meeting

A special session on marine studies and coastal zone management was held by the Canadian Association of Geographers (CAG) at their 1981 annual meeting in Cornerbrook, Newfoundland. Topics included aspects of offshore hydrocarbon exploration and development and its potential impact in two areas of Canada, Newfoundland and in the high Arctic. The papers presented will be published by St. Mary's University, Department of Geography, Halifax, Nova Scotia in their Occasional Papers in Geography series. In addition the Canadian Association of Geographers gave formal recognition to a Special Study Group on Marine Studies and Coastal Zone Management. There will be a meeting of this group at the CAG annual meeting in Ottawa next year.

Fifth Joint Meeting - Canadian Environmental Advisory Councils -
June, 1980 - St. Andrews, New Brunswick

Recommendations of the Workshop on Shore Zone Management

The Canadian Environmental Advisory Councils recognize that the imminent production of off-shore oil and gas necessitates a system of short (exploration) and long-term (development) shore-zone planning that will minimize adverse environmental effects.

In carrying forth the principles of shore management endorsed by the CCREM it was recommended that priority be given to the following areas of concern:

- a) Identification of renewable and non-renewable resources which could be adversely affected.
- b) The necessity for relevant basic and applied research.
- c) The development of appropriate physical and institutional models.
- d) The identification of sensitive ecological areas within shore zones.
- e) The necessity for environmental impact study for any significant project.
- f) The development of appropriate public information programs.

The implementation of the foregoing necessitates a close co-operation amongst all levels of involved governments.

B. International

NATO-CCMS Pilot Study on Estuarine Management

Background

The Committee on the Challenges of Modern Society (CCMS) was established in 1969 as an extension of NATO. It has previously commissioned national pilot projects on the physical and social environment with a view to stimulating national or international action regarding certain resource management problems. For example, Canada figured prominently in a previous CCMS pilot program on river basin planning. The Canadian pilot project was the Saint John River Basin and a publication concerning this exercise was produced in 1971.

Attention of the CCMS is now focussed upon estuaries, since these areas are of such great value for world food production. Their increasing pollution from a variety of toxic chemicals and the other demands made upon them by man make their management of vital

importance. Accordingly, it was decided to cooperate jointly on a study of common problems and to develop protection for the resources of important estuaries. A Work Group was formed in 1979 to evaluate comprehensive management strategies in estuaries that have been applied by member countries in preventing environmental degradation. Known as the CCMS Pilot Study on Estuarine Management, the Work Group is chaired by the United States, with representatives from Belgium, the United Kingdom, Greece, Italy, the Netherlands and Canada (as of September, 1980).

The first meeting was held in Brussels, Belgium. At that time, potential areas of cooperation were discussed and specific estuaries for study identified. A request for Canadian participation was made by delegates from the US and UK. In June, 1980 a second meeting was held in London, England to produce a work plan for a report and identify a schedule. The US representative agreed to prepare a draft document representing a synthesis of the approaches. It was felt that Canada should at the least have an observer at this meeting. Accordingly, the Scientific Liaison Officer from the Canadian High Commission in London acted in this capacity. Realizing the potential benefit from this exercise for the Fraser estuary agreement, the decision was made to appoint a Canadian representative in September and to use the Fraser as our case study example. Contact was made with provincial officials on this matter as the Fraser is currently being planned under a federal-provincial agreement. British Columbia has lent its full cooperation to the study. The National Coordinator, DOE Shore-Zone Program was appointed as Canadian representative.

The Fraser estuary was presented as the Canadian case study at the third meeting in Annapolis, Maryland, and a copy of the federal-provincial task force report on the estuary completed in 1977 was tabled for background information. Both the report and presentation were well received. Representatives from Belgium, the Netherlands, Italy and Greece were particularly interested in the Canadian approach of using a federal-provincial agreement to produce an estuary management plan that included a regional government representative on the steering committee.

Reviews were also presented of the other case study estuaries: the Thames estuary in England, the Scheldt estuary in Belgium, the Tiber estuary in Italy, Amvrokikos Bay in Greece, Lake Grevelingen in the Netherlands and the Potemac estuary in the United States. Although each estuary is quite different physiographically, there were many common areas of concern regarding their management. These include: (a) the question of how to divide institutional jurisdiction for estuary management among responsible land-based and water-based agencies; (b) whether a centralised or de-centralised approach should be taken to resource management administration; (c) the need for greater refinement of current mathematical modelling capability for estuaries; (d) the need for greater clarity in describing resource trade-offs; (e) developing better mechanisms for public involvement in the decision-making process.

A draft report on a summary of national programs on estuarine management completed by the US representative was put forward for comment. After considerable discussion the draft report was revised, and a framework agreed upon.

Copies of the 1977 federal-provincial Fraser River Estuary Report were obtained from the provincial government and were sent to the CCMS Working Group Chairman for background information. The Canadian report was completed in cooperation with Regional DOE and provincial personnel.

The Working Group Chairman has agreed to circulate a second draft report to member countries based on comments and revisions received, including the Canadian report by March 1, 1981. It is hoped that the final report will be ready for publication in October, 1981.

International Conference on Oil and the Environment - "Onshore Impacts of Offshore Oil" - Edinburgh, Scotland - September 28 - October 2, 1980

A major international conference concerning the onshore impacts of offshore oil was held at the University of Edinburgh, Scotland, September 28 - October 2, 1980. Its aim was to review the environmental consequences arising from ten years of North Sea oil and gas development. Chaired by A. M. Dunnet, Director, Thompson Scottish Petroleum, the conference was sponsored by the UK Institute of Petroleum, the Norwegian Petroleum Society, the Royal Town Planning Institute, the Town and Country Planning Association, the EEC (Environment Directorate) and the Royal Institute of British Architects.

More than two hundred delegates attended from the principal oil producing nations. The Canadian group included both federal government representatives and a contingent of provincial resource managers, civil servants, and politicians from all levels, as well as representatives from the private sector.

Day 1 - North Sea Coastal Lands: Environmental Impacts and Planning

The conference took place over three days. Session one was devoted to the North Sea Coastal Lands with papers on environmental impacts, planning, and oil strategies and development. The first paper was presented by Mr. Geof Larminie, General Manager, BP Environmental Control Centre. Mr. Larminie gave an overview of BP's environmental planning activities respecting the development of the Forties Field in the North Sea, as well as their experience in developing Prudhoe Bay, Alaska. BP has been especially

conscious of the need to develop a process whereby company environmental studies and activities are coordinated with public authorities. The BP Environmental Control Centre (ECC) was created to develop a company environmental policy and to provide appropriate advice and information. New initiatives and action programmes initiated from this group are designed to ensure that company activities are conducted in an environmentally responsible manner.

BP undertakes environmental impact assessments for its major new developments and these are evaluated by the ECC. Assessments have been completed for the Forties Field, the Sullum Voe oil terminal in Shetland, as well as the Alaskan North Slope and the Maui gas field in New Zealand.

The BP track record has been reasonably good. There have been no blowouts in their North Sea holdings thus far. There was one major spill at the Sullum Voe, but, the effects of this were difficult to judge, particularly from the socio-economic viewpoint.

Mr. Larminie noted that increasingly, the need to protect commercially important natural resources will place a much greater burden of responsibility upon the oil industry from the standpoint of maintaining environmental quality and at the same time to investigate new energy sources. Faced with the tensions created by these two demands, BP is trying to develop new safer technologies.

Dr. Max Nicholson, the first Director General of the UK Nature Conservancy Council (NCC) then presented a paper on an environmental overview of the North Sea and its coastal lands. His point was the necessity to treat the North Sea and its coastal lands as a single complex interacting system, the stability of which is currently at risk. Its current piecemeal treatment by single-sector professionals (whether scientists, administrators, industrialists or managers) aggravates the problems of management, establishing policies and priorities, and sorting out jurisdictions. The inadequacy of present approaches is especially apparent from the environmental aspect. Interdepartmental sharing of information at the Central and local government level is poor. There is a major problem with estuary pollution. Salt marshes are disappearing, as well as a range of habitats in the North Sea nearshore zone.

Nicholson singled out the absence of an informed public opinion as a major problem. Decision-makers in the hinterland were and are controlling sea/coastal areas they never see. In his opinion, there is an urgent need to integrate key information cartographically and statistically to demonstrate nearshore interactions, and to present this information to the appropriate bodies as well as the general public. He suggested that the EEC might play a significant role in solving these problems.

Mr. W. D. C. Lyddon, Chief Planner of the Scottish Development Department spoke on physical control strategies used by Scottish

authorities respecting North Sea Development. The scale has been enormous. Between 1970 and 1975, 60,000 new jobs were created, 2,000 hectares of land developed and 14 communities dramatically affected. In 1975, 78 drilling rigs were employed in active operation. In that original five year period, five major oil and gas terminals, all service bases and four land pipelines were approved without the need for a public inquiry. Four platform yards did undergo a public inquiry because of the siting in environmentally sensitive areas. How was this accomplished without major conflict?

An Oil Development Council chaired by the Secretary of State for Scotland was created in 1974 to produce an overall strategy for Scottish oil development. This was followed by the establishment of a permanent Standing Conference on North Sea Oil. An Oil Task Force was also created consisting of all related government departments. An Environmental Forum was then set up to provide advice to the Task Force, chaired by the Nature Conservancy Council for Scotland.

The Scottish Office then undertook a major survey of the entire Scottish coast. First priority was given to the Scottish east coast, and this was finished in 1975. National planning guidelines were produced and advice provided to local planning authorities on environmental assessment. A local authority manual was produced for project appraisal and development control. A series of conservation zones and preferred development zones was established for the coastline.

Lyddon concluded that early advance planning for development was not easy due to the uncertain effects of exploration. However, if public bodies are adjusted for coordinating and communicating information on oil-related development to local authorities, and if new instruments are developed for planning control at each level by adapting current procedures, much of the anxiety that is produced by sudden development can be overcome or significantly reduced. In Lyddon's opinion the biophysical effects of development of the North Sea Oil on the landscape were well handled. Labour structures and community social patterns were the elements disrupted the most.

Mr. Gunnar Gjerde, Head of Planning and Negotiations for the Norwegian Ministry of Petroleum and Energy then provided the Norwegian viewpoint. Since 1978, Norway has been an oil exporting nation. Petroleum accounted for 14 percent of GNP in 1980. This is expected to rise to 20 percent by 1990, and will account for 40 percent of the value of all exports. Over 36,000 are presently employed in the oil industry, of which 6-7,000 are foreigners. The state oil company Statoil, is the dominant force in Norwegian petroleum development.

Under current arrangements, Norway requires all of their North Sea oil and gas to be landed at Norway except under special permission of the Minister. In some cases the oil is first shipped to the UK

for desulphuring and then to Norway for final refining. Two major refining centres are being enlarged or constructed. An existing facility at Monkste is being renovated and a completed new one is being built at Bamle near Bergen. Under a so-called "Concession" policy, the Norwegian Government decides the level of government participation in the exploration phases, and where such exploration shall take place. The key is that the state controls the rate of development. This in turn largely determines the level of impact.

Coupled with this policy is an income policy that keeps wage settlements at around 10 percent and an accompanying price freeze. At current rates (inflation runs around 11 percent), Norway will have enough government revenue to pay off its foreign debts next year (these are estimated at \$30 billion). Oil and gas output will be controlled by the government at 60 million tons per year. At the same time the government is embarking on an ambitious exploration programme in the high Arctic. Drilling has started at 71°N between Norway and Iceland. Two wells are completed and a third well is about at total depth. Some small "interesting" hydrocarbon shows have been reported. As a precursor, resource mapping of the entire Norwegian continental shelf is being undertaken. Long term oil reserves are likely to exceed 9 billion barrels. The Norwegians are most interested in Canada's experience in the Beaufort, particularly regarding our planning approaches.

The key to Norwegian success in the North Sea has been their strict control of foreign investments into Norway (especially the multi-national oil companies) and their ability to keep a tight grip on interest rates. This continuity in policy has ensured a stable set of rules for the multinationals. While the rules are not popular, there is at least consistency in government policy.

The next paper was presented by Mr. Jim McCarthy, Deputy Director of the Nature Conservancy Council (NCC) of Great Britain. The NCC is essentially an advisory body responsible for wildlife conservation in Britain. It has been their policy to follow 3 strategies with regard to oil and gas development: (a) completion of an inventory of wildlife resources in shore zone; (b) definition of areas of importance for wildlife (included within Sites of Special Scientific Interest); and (c) assistance to local authorities with impact appraisal in the planning process.

Day 2 - North Sea Oil Strategy and Development

The second day was devoted to papers on oil strategy and development. Norwegian explorations above 62°N parallel were reviewed, as well as platform construction and the development of the Forties Field. Probably the most interesting was the paper of Mr. Terje Linde, Senior Advisor for the Norwegian Ministry of Petroleum and Energy. As noted above, Norway has begun a major exploration push in her Northern waters. The situation to the Canadian North is roughly analagous. Population is concentrated in small coastal villages, and the possibility exists of a large

potential impact on the sensitive Arctic ecology. As in Canada, the Central government controls all development north of 60°.

The Ministry has significant doubts about the industry's preparedness for spills, and the ability of the area to cope with massive development. They expect many objections to be raised by fishermen. These doubts will hopefully be offset by increases in safety control measures and experience. Preliminary evidence indicates that even large spills show no long-term effects in marine stocks in Southern waters, but the sensitivity and uniqueness of the Arctic ecology is appreciated.

Several strategies have been adopted to counter these problems. Supply routes for exploration areas have been designated; the time for exploratory drilling has been limited (7 months of the year April - October) and the level of exploration is controlled as well as the area. To date there have been "very interesting" shows of hydrocarbons.

Possible impacts in the North were scrutinized by a Norwegian Royal Commission Report in 1976. The Commission recommended a thorough mapping be made of the potential of the continental shelf as well as showing possible areas of conflict among resource users.

The Ministry's focus has been on resolving potential conflicts between offshore and onshore users. Environmental Impact Statements (EIS's) are not compulsory in Norwegian law, but are termed "desirable". Baseline studies are now being undertaken in potential drilling areas. Coordinated central and local government plans are being created in coastal areas with reference to the impact of supply bases.

Mr. Geof Larminie, Director, BP Environmental Control Centre, then presented another paper on the development of the Forties Field, the first major oilfield to be discovered in the North Sea. Present flow in the field is some .5 million barrels per day. Mr. Larminie summarized the lessons learned by BP in developing this field from the standpoint of environmental impact. He is doubtful if the impact of development on established communities can even be listed. He is convinced that there is no satisfactory method of objectively assessing effects in a reasonable way. As an aside, the North American system of EIS's under NEPA in the US has added enormously to the cost of BP's projects. From 5 to 10 percent of total project cost is now calculated in as a given level.

Mr. Larminie indicated that with judicious pre-planning, many of the obvious problems associated with rapid development can be minimized. "The role of reasonable compromise and rational debate among competing users in the successful completion of the Forties Field cannot be underestimated" he stated.

This Session led logically to one on Environmental Impacts, both from the standpoint of land use planning and community development

and control of hazards. Mr. Claus Stuffman, Head of General Planning and Environmental Improvement, EEC Environment and Consumer Protection Service spoke on the European Community and Environmental Assessment. EIS's similar to the US are virtually unknown in Europe. Only France, Ireland and Luxembourg have formally adopted the approach in legislation. Of these, only projects over 6 million francs in France and £5,000,000 in Ireland require an EIS. Other countries are seriously considering their use, or have developed fairly complete planning and development control procedures, such as the UK. Official attitudes remain cautious though. The EEC has proposed that EIS's be made mandatory unless exempted by criteria listed by member states. A pilot ecological mapping scheme being undertaken by the EEC and tested in 10 areas is to be submitted to Council in 1981. A guideline of 1 percent of total project costs to be devoted to EIS's has been suggested.

In the next paper, Professor Ian McHarg of the University of Pennsylvania delivered a lecture on the US National Environmental Policy Act with special reference to Energy Risks and Handling. It is Professor McHarg's view that the exploitation of energy resources on gigantic scales have produced gigantic risks as well. "Both littoral and continental shelf are intolerant environments where offshore oil exploitation provides a continuous threat" he stated. In the face of this or McHarg recommended a new system of comprehensive shore-zone planning based on an ecological approach. By this, he means combining geological, hydrological and biological data to produce a biophysical model of the immediate shoreline environment which is then used by social scientists to produce culturally acceptable plans. It is his opinion that government agencies pose the greatest threat to the environment because of their current single-sector approach and presumption that the State knows best.

Day 3 - Case Study Areas for Impacts

Papers were presented about the impact of North Sea Oil on three case study areas: Orkney, Aberdeen and Shetland.

(i) Orkney

Mr. Graeme Lapsley, Chief Executive, Orkney Islands Council then reviewed the impact of North Sea Oil on Orkney. After the oil companies indicated that an oil terminal might be located in Orkney in 1972, the County Council adopted an interim planning strategy as part of its official Development Plan of 1973. The island of Flotta was chosen as the location for an onshore terminal. The planning strategy involved the following steps: 1. Special powers over land on the island were assumed by the Council for development control purposes. 2. Statutory control was taken by the County for harbour authorities under the Orkney County Council Act 1974, supported by the creation of a special reserve fund. 3. Land on the island was purchased and then leased to the oil companies (The Occidental-Getty group). 4. After initial planning consent was

given, conditions were attached to the lease back of the terminal. Licences were then issued by the County for single works such as jetties with strict conditions attached. 5. A "disturbance agreement" was signed based on a royalty-type of payment from the companies for upsetting the local amenity. 6. Harbour payment agreements were signed. Under these, boats and crews were paid for by the companies and a levy per barrel shipped out of the terminal at Flotta was demanded (£600,000 was collected in 1979). 7. Baseline studies were conducted in cooperation with the local university to establish an ecological benchmark against which any shoreline changes could be measured. In addition, a separate venture was undertaken by the Council. A fire-fighting tug was purchased with the understanding that any ship coming into the terminal has to be accompanied by the tug, and would be billed accordingly. The Council also controls the pilotage authority and has hired marine officers to run it.

The major terminal, Flotta, opened in 1975. Since then 804 ships have landed, including 600 tankers. During this time 10 accidents have been reported with a total spillage of some 60 barrels. Patrol launches operate day and night. Strictest control measures are employed to ensure this safety level is maintained. The oil companies share the expense. The major negative impact has been on the cost of hiring local labour (imported labour has driven up costs) as well as supplying supporting infrastructure. Those who were imported to work (1,700) have to live outside Orkney County by law.

There have been obvious advantages to the development. The disturbance fund has offset much of the infrastructure cost. 80 percent of moneys received from the agreements, (leases, harbour dues etc.) go to maintain indigenous industry. 10 percent goes to environmental improvement and 10 percent to recreation and leisure. About 550 permanent jobs were created for Orcadians as a result of development. Better ferry and air service has resulted. In addition the population of Orkney increased by 5,000 from 1971 to 1980.

The major lessons learned by the Council were as follows: 1. Establish a vetting mechanism for company applications that allows a comparison of alternative sites for development. 2. Establish right away what you do not want (refineries, aggregate mining, etc.). 3. Employ negotiators who will stay-usually the Chief Executive - not politicians. 4. Keep the negotiating group small. 5. Pass legislation if necessary so that your authority can turn a profit. 6. Involve the local population through liaison/advisory groups as much as possible.

(ii) Aberdeen and the Grampian Region

A second paper by Mr. T. G. Sprott, Director of Physical Planning of the Grampian Region outlined the impact of oil in Aberdeen and surrounding area. Prior to the oil, Northeast Scotland was a depressed area. Most development plans were outdated.

Infrastructure was inadequate. The major advantages involved improvements to physical plans and services. In the period 1970-80 there have been major improvements in the harbour at Aberdeen. It is now possible to use the harbour 24 hours a day. Helicopter operations are the largest in Europe. Over 1.4 million passengers per year use the Aberdeen airport.

The major disadvantages included conflicts with fishermen and infrastructure demand. With the former, damage claims to fishing gear were submitted and resolved through a joint committee. The visual impact of the city has been changed, with a rapid growth in office facilities, and suburbs. 30,000 new houses have been constructed. The average price increase of a house has been 350 percent. Average wages in Aberdeen are now 106 percent of the UK national average, and enormous demands have been made on recreation, leisure facilities, water supply, sewage infrastructure, roads etc. The major problem confronted by the County Council was gaining the advance information on the scale and rate of offshore activity so that proper advance planning could be completed.

Lessons learned included the need for a 5 year lead time to allow the build-up of appropriate infrastructure. It was stressed that contingency planning must be undertaken as soon as possible - this avoided much of the visual intrusion. Government financial support was required for proper planning and development, as was support from the oil companies themselves. Coordinated government-industry planning is therefore an essential need.

A contrast with Aberdeen was drawn by Ms. Adlene Hanson, Regional Administrator of the US EPS Region 6. She pointed to the development of the Gulf of Mexico and the Texas/Louisiana coastline as case examples, a picture of overlapping jurisdictions, federal-state conflicts and a threat to health from the poor siting of associated petro-chemical industries. Houston was described as large, over-grown and extremely polluted. The Houston ship canal periodically catches fire. It was Ms. Hanson's opinion that only where local support is strong can industrial siting be affected. Land use planning at the coast is still anathema to most Americans, however. The best the EPS hopes for is a negotiated peace among combatants. Nine organizations review federal permits, and EPA reviews state plans. Control of waste water discharges has been more successful, but permits are slow to be issued. Recently, a Preservation of Wetlands Act and Coastal Zone Management Act have brought new hope for national planning to the area, but their effectiveness is still in doubt.

(iii) Shetland

A different example was provided by Mr. Mike Fenwick, former Director of Planning of the Shetland Islands Council. From 1972 to 1980 the population of Shetland has risen from 17,000 to 22,000. At the beginning of the oil boom Shetland started off with a viable local economy based on crafts, and fishing. She therefore did not

have to sacrifice any environmental standards to attract the development.

A fundamental decision was made by the Council, that if oil was to come, it would be on Shetland's terms. That year a group of consultants was commissioned by the Council to evaluate potential development sites. The nearshore land and water environments were considered together. Based on this study, an interim development plan was produced and policies generated to establish where development could occur and how it would be controlled i.e. centered at Sullum Voe. It was proposed that major installations would only be allowed on land owned by the County, and the oil companies were directed to perform as one, sharing facilities.

In 1974 a private Act of Parliament was passed, the Zetland County Council Act. This Act gave the Council wide-ranging powers including (1) compulsory purchase of land; (2) power to become a port authority; (3) control of offshore works (dredging and pipelaying) to 3 miles offshore; (4) the ability to create a company for towage; and (5) power to create a reserve fund designed to meet the time when oil no longer flowed.

The Sullum Voe Association Ltd. and its advisory groups were established in association with the major oil companies (there were 30 involved). This was a management device to supervise all oil-related development. Advisory committees handled oil spill procedures, environmental matters etc.

Much of the success of the Shetland development procedure depended upon the force of personality of one man, Mr. Ian Clark, the Chief Executive of the Shetland County Council. Community involvement was also critical. Sullum Voe became a major terminal, taking up 1,000 acres, and employing 6,000. Lerwick, the capital has become a major supply base, the airport load growing from 10,000 passengers in 1970 to 800,000 in 1978.

The major physical impacts involved quarrying for construction materials and building. The major economic impact was the draining away of labour from traditional crafts to work in the industry. Property values shot up. Studies showed that people close to the development were less concerned about changes than people who lived further away. While the impact of massive oil related development has for the most part been for the good, there are no illusions on the part of Shetlanders. Without a significant degree of pre-planning, a resolute Chief Executive Officer and remarkable timing, the development could easily have been an ecological and socio-economic disaster from which Shetland would not have recovered.

Conclusion

In summary, the conference was an excellent way to gain an insight about how the oil companies perceive the impact of their developments upon the shore zone. Unfortunately, due to the

conference structure, there was little time provided for discussion or debate. There were no papers presented by the natural resource users—fishermen, coastal farmers, or landowners. This meant that much of the discussion was flat and somewhat self-congratulatory.

Nevertheless, from the Canadian viewpoint, there are lessons to be learned. These are summarized as follows:

(a) Physical Impacts

Bio-physical impacts on the shore zone from oil and gas development in the North Sea have been much less than first imagined. While the risks of major spills have certainly increased, the safety record of the industry has been outstanding thus far.

(b) Socio-Economic Impacts

Socio-economic impacts have been the greatest problem. The building of all the infrastructure demanded by the construction phase of development has put great strains on local authority budgets. The production phase means fewer jobs, an immediate loss of population, and an over-built infrastructure. More serious is the need to re-integrate the local labour back to the traditional patterns of work. This problem is yet to be satisfactorily addressed.

(c) The Need for Planning

In almost every paper there was a call for more pre-planning for development. There is not enough attention given to the integration of environmental issues into the development process. Local participation and support is critical. The key is to control the rate of development through a strategic plan for the immediate shore zone as well as an overall consistent government development policy.

(d) The Utility of Impact Studies

Major questions were raised about the way in which impact studies are being carried out. Much of the information produced is unwanted or unneeded. In the UK, studies have been very detailed; in Norway, studies are much more generalized. In both cases the current approach is insufficient. The need to treat the shore zone as a single ecosystem for planning purposes was stressed. Many problems relate to how more apt information can be generated for decision-makers by using existing Environmental Impact Statement (EIS) formats.

6. NEW POLICIES AND PUBLICATIONS

The text below is the summary of a contract study funded by Environment Canada on the applicability of the Scottish and Alaskan offshore oil and gas experience to the Canadian Beaufort Sea. The Study was completed by Dr. J. G. Nelson and Ms. Sabine Jessen of the University of Waterloo, and does not necessarily represent federal government policy.

A) Applicability of the Scottish and Alaskan Offshore Oil and Gas Experience to the Canadian Beaufort Sea

At the outset certain general premises should be stated. First, this report on Scottish and Alaskan experiences with offshore oil and gas development will be applied to the Beaufort Sea only in terms of general principles and recommendations. There is a need to study the social, economic, environmental, and especially the political and institutional circumstances in the Beaufort Sea more closely before more specific recommendations could be made for that area. Further to this point it would, in my view, be a mistake to prepare any basic or specific recommendations for resource and environmental management or other aspects of Beaufort Sea development without early and serious contact with the people of the region. The views of the local people are very important. Finally, my thinking about the applicability of the Scottish and Alaskan experience to the Beaufort Sea - Mackenzie Delta area is guided by certain basic assumptions or guidelines. Too much change should generally not be attempted too quickly. Care should be taken to make any actions accord so far as possible with what is likely to emerge from the COPE and similar agreements. And, in general, new or modified institutional arrangements should complement or enhance rather than compete with existing ones. In this context I am thinking particularly of the resources, environmental and land use pressures developing along the coast and nearshore waters where no senior or local government agency or programme appears to have basic responsibility and jurisdiction.

In my study the problem is to determine the applicability of the Scottish and Alaskan offshore oil and gas experience to the Canadian Beaufort Sea where Dome Petroleum and other companies are proposing to develop numerous oil fields, petroleum collection systems, harbour and other facilities. This development would occur in an area highly valued by native people and other North Americans for beluga whale, caribou, snow geese, and other wildlife. These renewable resources would be changed to varying degrees by oil spills and other effects, as would trapping, hunting, tourism, and other activities dependent upon them.

Scotland and Alaska were selected for comparison with the Canadian Beaufort Sea for several reasons. Oil and gas development have been underway particularly on the east coast of Scotland for several years and the effectiveness of environmental and land use management programmes is therefore assessable. Northern Alaska is

on the verge of offshore drilling, exploration, and development so that assessment is more difficult there. However Alaska is of further interest because it is subject to the 1972 U.S. Coastal Zone Management Act, federal enabling legislation which could be duplicated in Canada. In Scotland and Alaska the Shetlands and the North Slope Borough are especially similar to the Canadian Beaufort, being isolated, with harsh environments, low populations, substantial dependence on fish, caribou, and other renewable resources, as well as having long human occupancies and strong ethnic characteristics in resident peoples.

This study is based upon a hierarchical management assessment model consisting at the first level of agency, planning, construction and implementation, and general guides or characteristics. At the second level other management processes are considered, for example strategic planning, social and biophysical inventories, resource classification systems, benefit/cost and other evaluations.

Analytical results reveal a strong local response has occurred in both the Shetlands and the North Slope Borough. In the Shetlands this response has largely been within the context of a modified pre-existing local government system. In the North Slope Borough the local response has partly been supported by technical and financial assistance through the 1972 Coastal Zone Management Act. In both areas the response has also been supported by local income from oil development, land ownership and related enterprises.

Considerable anticipatory and strategic planning has taken place in the Shetlands, the North Slope Borough, and other parts of Scotland and Alaska. Three basic management strategies have been pursued: insulation and containment; integration and absorption; and major social and economic change. The first two have been stressed in the Shetlands. These strategies have been associated with and largely based upon biophysical and social inventories; land and water classification; identification of especially significant areas; environmental impact and other evaluation; careful permit approval procedures; research; and other management processes. Concern about monitoring is high in both Scotland and Alaska, primarily because much uncertainty applies to many projects. Surveillance and inspection procedures require strengthening in both areas.

In contrast many of the aforementioned management processes are absent or inadequate in the Canadian Beaufort, notably from the government standpoint. The Canadian Beaufort Sea area also lacks the large scale local land ownership, strong local government, and greater self-reliance found in the Shetlands and the North Slope Borough.

Management effectiveness was not studied in the field in Alaska; in the Shetlands however it has been relatively high. Numerous labour force and other forecasting errors have been made, leading to under-estimates of housing, school, and other development

requirements in these islands. Pipeline impacts have been managed reasonably well. Fisheries are under heavy pressure. Eight oil spills have occurred since the November, 1979, Sullum Voe oil terminal opening. One spill was major, causing thousands of sea bird deaths and other damages. A costly but effective shore-zone management system has been developed which is under local control to the three mile limit and financed by oil development income. The 1974 Zetland Act is basic to the strong local response in the Shetlands. Among other things this Act provides for local harbour and shore zoning powers, local participation in oil development, and pilot and other local levies on tanker use and oil production.

Certain principles can be derived from the Alaska and Scottish experience which are applicable to the Canadian Beaufort. These principles largely derive from the fundamental conclusion that local land ownership, strong local government, and associated financial and technical benefits have resulted in a self-reliant, intelligent and effective response in both areas. The principles are: (1) Strengthen local government (Regional Government); (2) Improve the project approval system (a comprehensive permit with a strong regional role); (3) Allocate land to the native people and the territorial government; (4) Create a Canadian Beaufort Sea - Mackenzie Delta shore-zone commission or group; (5) Create an Arctic Environmental Forum; and (6) Improve Canada's shore-zone coordination system.

All of the foregoing principles are important and the first four have very high priority. The creation of some type of regional government will however take time and care, for it involves two territories and a number of communities. Considerable early local involvement is very desirable. The land claims matter has been with us for years and the delay is a major impediment to making more progress in improving both development, and resource and environment management. Perhaps some form of open-ended agreement of the type in use in Northern Australia would help here. A comprehensive approval system somewhat like that administered by regional and local governments in Scotland and the U.K. would be an improvement, with detailed and specific air and water quality, or other permits being co-ordinated with and conditional upon general approval. The idea of a coastal zone planning group or commission is in my view a very important one for it addresses a current high pressure zone in the Beaufort and one that is not adequately covered by any existing management arrangements. The need to improve Canada's overall shore-zone co-ordination system is also very important; similar pressures and management issues are arising on the north, east and west coasts. The federal role in the shore zone and offshore waters is a very significant one that needs strengthening and further study and classification.

As the idea of the shore-zone planning commission or group has prompted considerable discussion further details from my main report are set forth below for information, clarification, and further thought.

A Beaufort Sea - Mackenzie Delta shore-zone planning commission or group should be established to coordinate planning of oil exploration, drilling, dredging, island building, construction, servicing, shipping, mining, hunting, trapping, fishing, defence, scientific and other activities in the onshore and nearshore zone of the Beaufort Sea - Mackenzie Delta area. The commission would also be responsible for tracking and reviewing petroleum development and other activities far offshore in the deeper waters of the Arctic shelf. In tracking and reviewing such activities the Beaufort Sea - Mackenzie Delta shore-zone planning commission would mainly be interested in the effects that these activities would have in the on-and near-shore areas. What, for example, would be the effects of developing a large deep water oil and gas field in terms of new docks, warehousing, navigation, infilling, dredging, and other onshore facilities and activities?

The planning commission would serve as the lead agency in planning for activities in the Beaufort Sea - Mackenzie Delta shore zone, activities whose growth and effects are frequently said to be subject to insufficiently coordinated permit and approval procedures by an array of different agencies mainly at the federal level. Many approvals are reportedly given without adequate understanding and careful consideration of the water movements, erosion and deposition patterns, wildlife habitat, native use, scientific value, or other aspects of the shore zone. Appropriate biophysical and social inventories, resource classification, evaluation and design studies are needed to provide the basis for an improved approval process. Such studies also are needed as a basis for considering and deciding upon alternative port, oil terminal, oil refinery, pipeline and other projects. Nor are approvals currently based on any overall strategy for the guidance of development as in the Shetlands, and the Sullum Voe oil port for example. The approval procedure also does not currently involve any significant role for the local people and local government other than advisory and consultation functions.

As, for example, in the Alaska Coastal Policy Council, the local people and local government should be prominently involved in the membership and work of the commission so that one of its benefits would be assisting in the creation of strong regional and local government. In this context, within a few years, certain activities of the commission would likely become redundant in that they would be taken up by regional and local government, although the commission could continue to play a useful research and monitoring role for many years. To encourage such an evolution in role, the urgent planning tasks facing a commission should be assigned to a specified time period.

A Beaufort Sea - Mackenzie Delta shore-zone planning commission should immediately undertake the following basic tasks: (1) A comprehensive review of all available information on oil-induced development, major land and marine use proposals such as mining and shipping, and resource use and environmental protection in the shore zone; (2) Identify major information and research needs, for

example in strategic planning, inventory, sensitive areas classification, evaluation, and other aspects of the management assessment model used in this study; (3) Develop plans to meet these needs; and (4) Serve as a monitoring agency for petroleum production, other economic activities, and their effects on shore resources and environment, with a budget provided jointly by industry and government.

Some definitional problems will have to be decided quickly by the commission in consultation with industry, all levels of government, the native and resident organizations, and public bodies such as the Canadian Arctic Resources Committee (CARC), and the universities. These problems include a workable definition of the shore zone; which land use, resource, environmental and other effects are to be monitored and why; and what arrangements are necessary to avoid duplication with any monitoring programmes in existing government agencies.

The shore-zone commission should be composed of members with varying backgrounds, including several with both management and research experience. The membership should be representative of all major interest groups and should have a full time chairman as well as an adequate full time support staff and budget.

As part of its research and monitoring duties, the commission should immediately begin to receive and comment upon all land and marine proposals likely to have a significant effect on resources and environment in the shore zone, prior to their approval by any federal, territorial, or local government agency. A procedure will have to be worked out for determining what is a significant activity and in particular for commenting upon and monitoring apparently insignificant projects which could have important medium to long term cumulative effects. It will also be necessary to watch carefully for proposals which are likely to undergo major modifications as these could have large unforeseen impacts. In commenting on proposals on the basis of its research and monitoring functions, the commission would often provide recommendations on desirable courses of action for both oil and other developments, as well as protection of existing land uses and the resources and environment upon which they are dependent.

The need for a body such as the Beaufort Sea - Mackenzie Delta shore-zone commission is urgent. Crucial decisions are already in the balance, for example, the desirability and feasibility of concentrating port, oil terminal, refinery, servicing, and other activities in a particular area or areas. The shore-zone commission can also assist with some of the pressing planning and management functions currently performed in the Shetlands by organizations such as the Harbour Authority and the Shetlands Islands Council, at least until more suitable permanent arrangements can be planned and implemented in the Beaufort area.

B) Nova Scotia Erosion Program

The Nova Scotia Department of the Environment has announced a new program relating to coastal erosion. The Department will be undertaking several pilot projects designed to protect coastal lands from erosion. The projects will take place on the North Shore of the Cobequid Basin.

The objective of the \$134,000 program is to determine the effectiveness of so-called "soft" techniques, such as grass plantings or temporary sand groynes, to reduce the rate of erosion. Comparative projects will be conducted on the Northumberland Shore, where erosion is significant.

The program will involve an evaluation of the natural physical processes, such as waves and currents, which contribute to erosion. Remedial or preventative work will be undertaken on sites where these natural processes can be manipulated. The nature of work undertaken will depend on the nature and content of erosion at a specific site.

In a recent statement about the program, the Nova Scotia Department of Environment points out that coastal erosion is the result of several factors, including wave action, currents, a rising sea level, excessive groundwater, and others. These natural processes may be aggravated by such activities as the construction of roads and wharves. Homes, cottages, historic sites, recreational areas, farmland, and community and industrial infrastructure are being threatened by erosion.

However, the Department adds, erosion is a necessary factor in maintaining a balance within the coastal environment. It replenishes beach sand, thus performing an important function in maintaining recreational sites. In addition, beaches often protect other sensitive areas, in particular biologically productive salt marshes.

Specific sites will be selected in consultation with local groups. Once the works are in place, an eight month monitoring program, assisted by local residents, will be established.

An initial evaluation of the project will be completed by the summer of 1982. For further details on this program, contact the Nova Scotia Department of Environment, Halifax, Nova Scotia, P.O. Box 2107, B3J 3B7.

C) Eastern United States Coastal and Ocean Zones Strategic Assessment

The Eastern United States Coastal and Ocean Zones Data Atlas is the first product of a project jointly sponsored by the Office of Coastal Zone Management (OCZM) and the Council on Environmental Quality (CEQ). The project was conceived in January 1979 at a meeting between OCZM and CEQ following lengthy debates among federal agencies on proposals for construction of major petroleum refineries in Eastport, Maine, and Portsmouth, Virginia. Concurrently, the Department of Energy was forecasting the need for up to twelve additional refineries on the east coast. CEQ suggested the preparation of a set of maps of the east coast that would identify areas least suitable for major developments. The maps could be used by CEQ, NOAA, and other federal agencies, as well as the private sector, for advance planning and evaluation of various activities affecting coastal and ocean resources. These activities would include major tanker terminals, and pipelines from offshore oil and gas fields of the east coast.

A project team was organized to perform the work consisting of: James A. Dobbin and his professional staff at James Dobbin Associates Limited, Toronto, Canada; Charles N. Ehler, Daniel J. Basta, and Thomas F. LaPointe of OCZM's Office of Ocean Resources Coordination and Assessment (ORCA); and G. Carleton Ray and M. Geraldine McCormack-Ray of the Department of Environmental Sciences, University of Virginia. Work on the project was begun in June 1979. A limited number of copies of the east coast Data Atlas was jointly published by CEQ and NOAA in October 1980. A final project report illustrating two applications of the east coast data base, is scheduled for completion in March 1981.

The team's purpose was to develop a comprehensive data base which could be used to identify resource use conflicts and compatibilities in the coastal and ocean zones of the Eastern United States. Specifically, the data base is now being used to: (1) identify areas of the East Coast which are least suitable for major energy development; and (2) identify areas that should be further analyzed for possible special protection status, because of their biological and ecological importance.

The study area of the project extends from the Canada-United States border to the Florida Keys. Landward, it includes all coastal counties (as defined by OCZM) or the area of the coastal plain (as defined by the 100-meter contour), whichever is further inland. Seaward, it extends to the 200-mile limit of the U.S. fishery conservation zone (including all of the outer continental shelf as defined by the 200-meter isobath).

The data base provides a preliminary basis for identifying and better understanding some of the relationships between and among human activities and elements of the natural system as they interact in the coastal and ocean zones of the Eastern United States. It is organized by five categories of data: (1) physical environments; (2) living environments; (3) species; (4) economic

activities; and (5) jurisdictions. Over 125 maps have been prepared using the data. A scale of 1:2,000,000 or 1 inch = approximately 32 miles was used for the working maps and reduced further to 1:4,000,000 for publication in the atlas. This small scale is necessary to illustrate the spatial extent of living marine resources and economic activities. For example, many important species range over much of the entire east coast. During their lifetimes, some move many hundreds of miles from spawning areas to distant feeding grounds. In fact, species such as whales, marlin, tuna, turtles, and several important commercial fishes and invertebrates range well beyond the east coast. An adverse effect on an individual species in one area may impact that particular species in another part of its range and may also affect other species related either through food webs or through other ecosystem relationships.

Each map provides an overview of a specific feature for the entire study area and consequently can be useful on its own. For further analysis, maps can be studied in a side-by-side examination or with overlay techniques. This can help to identify temporal and spatial patterns, specific relationships and existing or potential resource conflicts. Maps can be combined either with a single category (e.g., to identify biologically significant habitats for several species), or across categories (e.g. to identify the spatial and temporal relationships between species and economic activities). Specifically, the maps can help develop information related to:

- environmental assessments of major development projects in a specified area;
- assessments of alternative locations for onshore and offshore activities;
- identification of areas which may require special protection based on biophysical characteristics and inferred environmental stresses;
- preliminary analyses for oil spill contingency planning;
- identification of areas requiring coastal and ocean resource management;
- identification of data gaps and research needs.

However, it is important to emphasize that the information presented in the Data Atlas and subsequent analyses undertaken by the project team are not substitutes for the detailed analysis and information required for making local, site-specific decisions. Neither are they a substitute for the detailed and comprehensive analysis required to identify the dependencies of species on oceanographic characteristics. The type and accuracy of the data base permits only preliminary analyses to be performed and conclusions of a "strategic" nature to be drawn. It should also be emphasized that while a simple overlay of this mapped data is useful as a "first cut", the observation of a spatial relationship

does not necessarily imply a cause-and-effect relationship or a resource use conflict.

Information from the Data Atlas and its supporting material are being used by the project team in two ways. The first is an analysis being performed to infer the risk to living marine resources of the east coast from land-based sources of pollution. This analysis is considering the relationship between two factors: (1) the presence or absence of various marine species at important stages of their life history (e.g., breeding, spawning, and nursing) in estuarine, nearshore, and offshore waters; and (2) the distribution of various pollutant discharges from land-based sources and their relative dilution in these waters. NOAA satellite imagery from the Nimbus-7 Coastal Zone Colour Scanner is being analyzed to approximate the seaward extent of pollutant discharge plumes from major river and embayments of the east coast.

The second function is an analysis to identify specific areas which may be of special biological importance to commercial, endangered, or ecologically important species. Depending on the species groups considered and the spatial distribution of areas important to their life histories as identified in the Data Atlas, specific areas are being identified, analyzed, and classified as candidates for special protection status which require additional analysis. This analysis is considering factors such as biophysical features of each area, the number of species in each area, uniqueness, commercial value of species in each area, and urgency for protection.

Other topics to be discussed in the final report of the project include future development of the data base, the range of strategic problems the data base can address, the level of analysis possible, limitations and gaps in existing data and knowledge, and priorities for future research.

The current version of the Data Atlas and the analyses now underway represent an attempt to collect, organize, analyze and present a significant amount of information in a relatively short time. The project team is aware of several shortcomings in the atlas and in the related analyses and recognizes the need for significant revision, updating of information, and addition of new information.

A revision and updating of the east coast Data Atlas is planned for 1983. For more information on the East Coast Project and the availability of the Data Atlas contact:

James A. Dobbin, Principal, at either:

85 King Street East
Suite 302
Toronto, Ontario
Canada M5C 1G3
(416) 363-5347

or

1511 K Street NW
Suite 927
Washington, D.C.
U.S.A. 20005
(202) 628-5806

D) Proposed ACROSES Compendium of Canadian Shore Zone Publications

It has come to the attention of the NRC Associate Committee for Research on Shoreline Erosion and Sedimentation (ACROSES) that many of our colleagues would like to have an up-to-date compendium of Canadian published research in the field of shoreline erosion and sedimentation. Such a list is obviously useful for consulting engineers, shore property owners, municipal and other governments as well as researchers, students and engineers specializing in the fields of coastal engineering, geomorphology, etc. to let everyone know who is doing what in a manner somewhat more detailed than a "who's who".

ACROSES is willing to compile such a compendium and distribute it to those people, firms, government agencies, etc. who have contributed. Thus, in the first instance, we ask everyone who is interested in such a compendium to indicate this interest by contributing the information upon which the compendium will be based.

In order to make the process as painless as possible for everyone concerned, ACROSES asks you to list publications by yourself, your firm and/or your employees on the attached forms (feel free to duplicate the form and pass it on as many times as necessary). ACROSES recognizes two distinct types of publications and would like you to separate your publications in the following two categories:

A. General Publications:

These include publications in journals, conference proceedings, etc. i.e. publications generally available in libraries.

B. Limited Publications:

These include studies for clients, internal reports, etc. of limited circulation but available on request (either for free, for a charge or on loan).

Further, ACROSES requests the publications to be listed only for the past five years (back to 1976).

SEND COMPLETED FORMS TO: Mr. D. H. Willis, Secretary
Associate Committee for Research on
Shoreline Erosion and Sedimentation
c/o National Reserach Council Canada
Building M-32, Montreal Road
Ottawa, Ontario, K1A 0R6

ACROSES PUBLICATIONS COMPENDIUM

Type of Publication

— A. General
— B. Limited

TITLE:

AUTHORS:

ORGANIZATION:

WHERE PUBLISHED AND DATE:

LANGUAGE:

KEYWORDS:

PRICE AND WHERE AVAILABLE:

SUMMARY (Optional)

7. SELECTED SHORE ZONE STATISTICS

TABLE 1 - Cargo Movements Through Canadian Ports

	Cargo loaded and unloaded			Vessel arrivals and departures		
	International shipping ¹	Domestic shipping ²	Total	International shipping ¹	Domestic shipping ²	Total
	thousands of short tons			number		
1935	18,522	..	..	70,132	136,986	207,118
1945	27,773	..	..	93,653	156,278	294,931
1950 ³	57,471	..	..	64,923	166,289	231,212
1960	89,518	81,367	170,885	68,419	233,961	302,280
1965	135,914	106,327	242,241	57,912	195,211	253,123
1970	164,210	124,817	289,027	50,604	156,379	206,983
1971	164,090	122,515	286,605	49,450	135,423	184,873
1972	175,672	122,404	298,076	49,016	125,617	174,633
1973	196,646	121,947	318,593	47,091	116,510	163,601
1974	183,897	118,241	302,138	42,272	106,529	148,801
1975	183,227	119,871	303,098	40,522	93,742	134,264

¹ Internal shipping includes trips that have one terminal point in Canada and the other in a foreign port.

² Domestic shipping includes trips that originate and terminate in Canadian ports.

³ Data for Newfoundland were included from April 1, 1949. Data for non-customs ports were included for the first time in 1957.

Source: Catalogue 54-203, Shipping Report: Part II, International Seaborne Shipping (1975), Catalogue 54-204, Shipping Report: Part III, Coastwise Shipping (1975); The National Atlas of Canada, Fourth Edition, Ottawa 1974.

TABLE 2 - Port Activity as Measured by Net Registered Tonnage of Vessels,¹ 1975

Port	Vessels arriving and departing, total net registered tonnage ²	Total tonnage of cargo loaded and unloaded	Number of vessels arriving at port ³	Ice conditions during winter ⁴
	thousands of tons			
Vancouver ⁵	44,794	35,521	9,736	open
Montréal ⁶	32,082	18,632	3,373	restricted
Sept-Îles ⁷	25,666	30,195	1,303	restricted
Thunder Bay	21,396	20,027	1,310	closed
Halifax	16,642	11,742	1,429	open
Hamilton	16,091	14,270	935	closed
Port Cartier	15,817	17,627	663	restricted
Saint John	13,935	10,850	988	open
Québec	12,758	12,496	1,016	restricted
North Sydney	11,502	623	1,728	open
Sarnia	10,124	9,090	1,552	closed
Baie Comeau	8,563	7,334	621	open
Sault Ste. Marie	7,744	5,930	506	closed
Sorel	6,977	7,428	530	closed
Port Hawkesbury	6,804	7,718	364	open
Victoria	5,752	1,976	2,058	open
Toronto	5,299	2,987	654	closed
New Westminster	5,237	2,481	2,013	open
Trois-Rivières	3,914	2,841	611	restricted
Port Alfred	3,882	4,004	353	closed

¹ Total net registered tonnage provides the capacity of the spaces within the hull and the enclosed spaces above the deck available for cargo and passengers, but excludes spaces used for the accommodation of officers and crew, and for storing navigation propelling machinery and fuel.

² Total net registered tonnage is counted for the arrival and the departure of each vessel.

³ Includes coastal traffic.

⁴ "Open" indicates that the port use is not restricted by ice; "restricted" indicates that the use of the port is restricted by ice at some time during the winter and "closed" indicates that the port is closed by ice at some time during the winter.

⁵ Includes Roberts Bank.

⁶ Excludes Contrecoeur, Varennes and Verchères.

⁷ Includes Point Noire.

Source: Same as Table 1.

TABLE 3 - Number of Vessels Owned by Canadian Commercial, Chartering and Private Water Carriers, by Province of Domicile, 1974

Province	Canadian flag			Non-Canadian flag-Active	Grand Total
	Active	Inactive	Total		
Newfoundland	60	8	68	-	68
Prince Edward Island.....	6	-	6	-	6
Nova Scotia	66	15	81	11	92
New Brunswick	56	2	58	2	60
Quebec	270	12	282	40	322
Ontario	1,526	66	1,592	8	1,600
Manitoba	38	1	39	-	39
Saskatchewan	21	-	21	-	21
Alberta	48	-	48	-	48
British Columbia	1,345	92	1,437	-	1,437
Northwest Territories ...	5	1	6	-	6
Yukon	4	-	4	-	4
Other	8	-	8	6	14
Canada	3,453	197	3,650	67	3,717

Source: Transportation and Communications Divisions, Statistics Canada, The Water Transportation Data Sheet, 1974, Advance Statistics.

TABLE 4 - Number of Transport Vehicles Registered in Canada

	Registered motor vehicles	Railroad motive power and rolling stock	Ships ¹	Aircraft ²
1910	5,945	128,112	..	..
1920	282,450	237,076	..	..
1930	1,232,489	227,824	..	520
1940	1,500,829	171,272	..	473
1950	2,600,269	186,590	14,816	2,242
1960	5,256,341	200,424	19,507	5,318
1970	8,497,339	194,955	27,072	11,315
1973	10,158,440	192,590	29,539	15,618
1975	11,442,643	199,110	30,563	17,990
1976	11,786,309	199,264	31,288	19,737
1977	12,547,247	192,971	31,953	20,976
1978	12,975,449	187,753	30,592	21,577
1979	13,338,700	185,781	31,068	22,594
1980 .....	..	..	32,130	23,624

¹ Includes fishing vessels.

² Includes aircraft with or without valid certification of airworthiness.

Source: Catalogue 52-209, Railway Transport: Part III; Catalogue 53-203, The Motor Vehicle; Catalogue 53-219, The Motor Vehicle: Part III, Registrations; Catalogue 51-202, Civil Aviation; unpublished information, Transportation Division, Statistics Canada.

TABLE 5 - Catches of All Species in the Northwest Atlantic by Selected Nations

	1961	1966	1971	1974
	metric tons, round fresh ¹			
Canada	655	997	1,105	845
Denmark	104	124	73	71
France	180	152	56	39
Federal Republic of Germany ...	174	178	134	83
German Democratic Republic ....	..	95	142	131
Norway	49	43	35	59
Poland	4	72	270	215
Portugal	197	202	153	145
Spain	208	240	269	184
Soviet Union	341	841	1,022	1,157
United States	441	968	979	1,029
Other	48	70	108	89
Total	2,401	3,982	4,346	4,047

¹ Round refers to fish in whole, i.e., uncleaned, not gutted form.

Source: International Commission for Northwest Atlantic Fisheries, Statistical Bulletin, Vol.24,1974.

Note: See Statistics Canada, Human Activity and the Environment, No. 11-509.

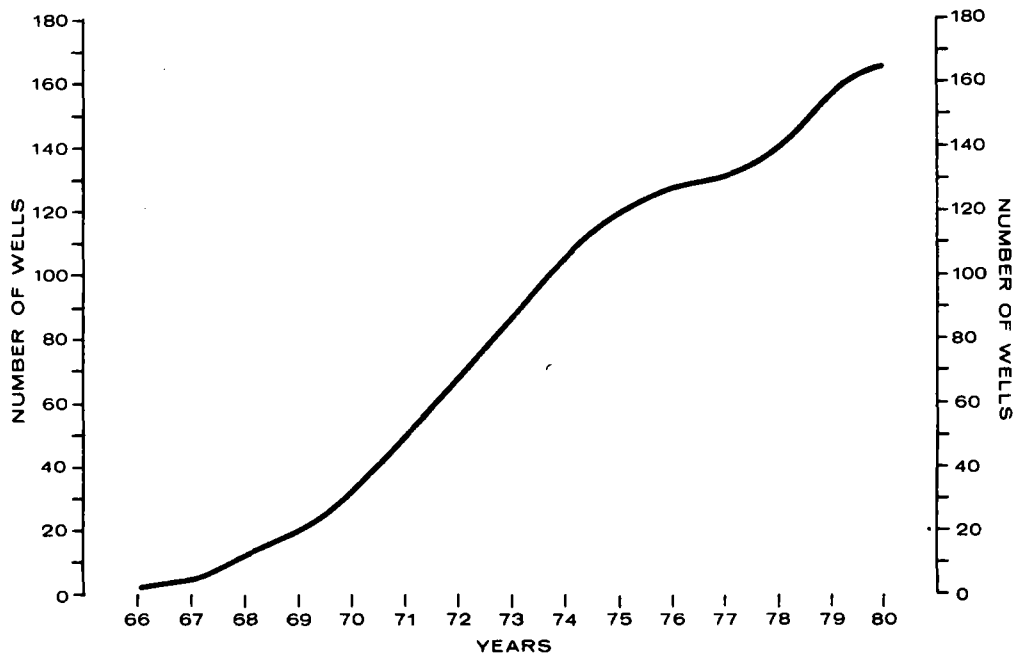
TABLE 6 - Canada Oil and Gas Permits

As of December 31, 1980 a total of 1,456 Canada Oil and Gas permits, involving some 41,444,512 hectares were held off Canada's East and West Coasts and in the Hudson Bay and Hudson Strait regions as follows:

<u>Region</u>	<u>Number of Permits</u>	<u>Hectares</u>
East Coast	1,169	33,668,298
Hudson Bay - Hudson Strait	62	1,398,784
West Coast	225	6,377,430
TOTAL	1,456	41,444,512

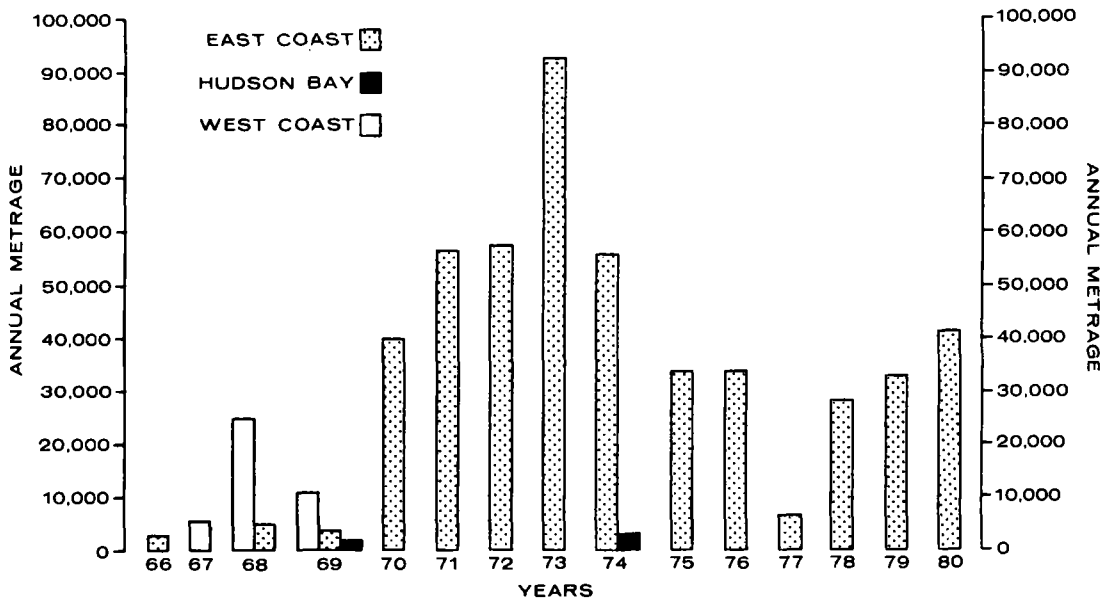
Source: Resource Management Branch, Energy, Mines and Resources Canada, December 31, 1981.

OIL & GAS DRILLING OFFSHORE CANADA
CUMULATIVE NUMBER OF WELLS



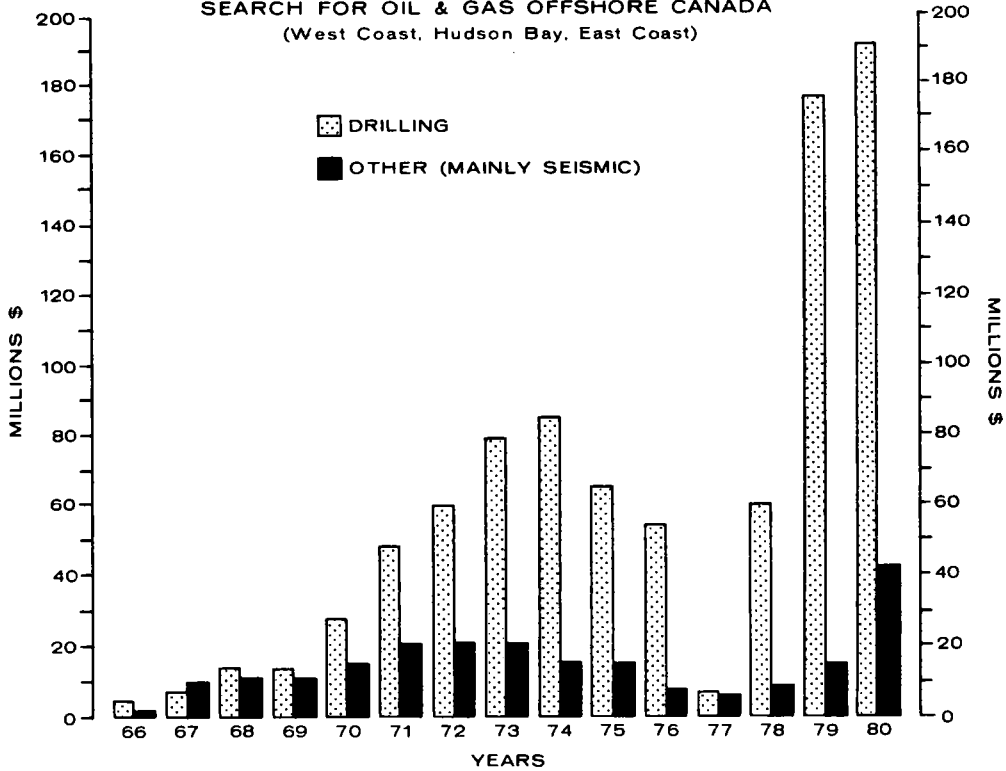
Resource Management Branch,
Energy, Mines and Resources
Canada

OIL & GAS DRILLING OFFSHORE CANADA
ANNUAL METRAGE



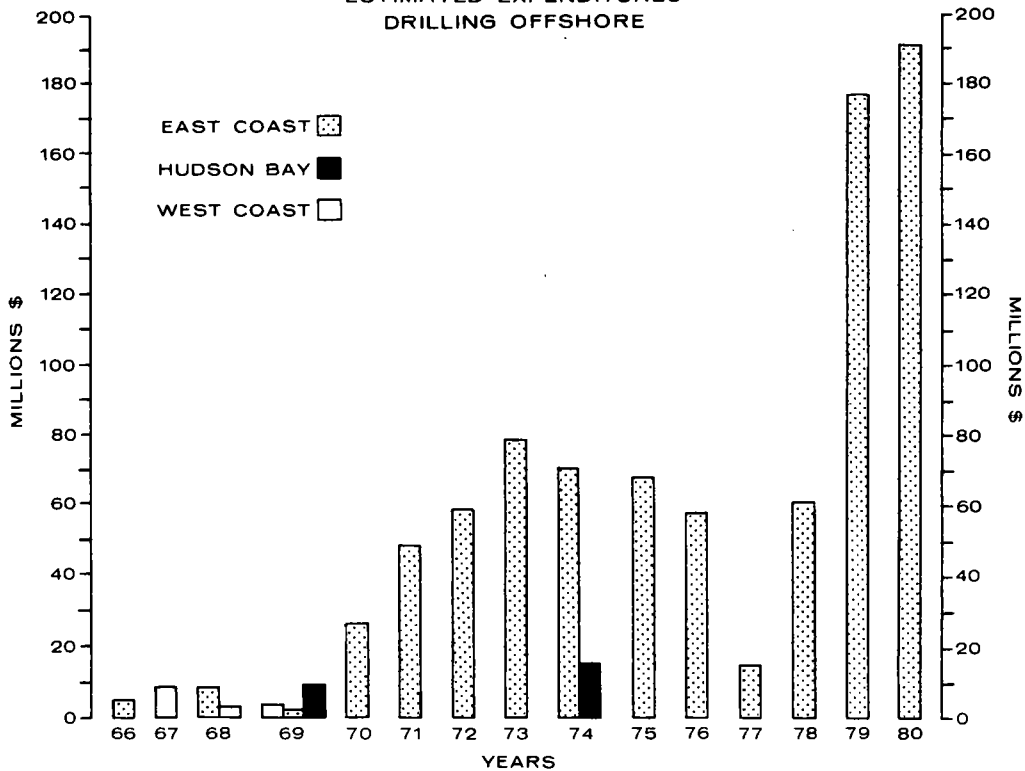
Resource Management Branch,
Energy, Mines and Resources
Canada

APPROXIMATE EXPENDITURES BY INDUSTRY IN THE SEARCH FOR OIL & GAS OFFSHORE CANADA
(West Coast, Hudson Bay, East Coast)



Resource Management Branch,
Energy, Mines and Resources
Canada

ESTIMATED EXPENDITURES DRILLING OFFSHORE



Resource Management Branch,
Energy, Mines and Resources
Canada