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SOME IMPLICATIONS FOR ALASKA OF PETROLEUM DEVELOPMENT ON THE NORWEGIAN CONTINENTAL SHELF

A REPORT

FROM THE

DEPARTMENT OF GEOGRAPHY AND MINERAL INDUSTRY RESEARCH LABORATORY
UNIVERSITY OF ALASKA

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United States Senate
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
WASHINGTON, D.C. 20510

October 17, 1978

The Honorable Jennings Randolph
Chairman, Committee on Environment
and Public Works
4202 Dirksen Senate Office Building
Washington, D.C. 20510

Dear Chairman Randolph:

In January of 1978, I traveled to Norway and Great Britain to view oil development in the North Sea. I was particularly interested in the socio-economic impact of oil and energy development on the people of both countries, and in Norway's and Great Britain's efforts to address the environmental consequences of oil production, such as oil spill prevention and regulation of pollutant discharges.

Two professors from the University of Alaska who traveled with me in Norway have written a report concerning a number of the issues surrounding energy development in Norway. Their report is of significant interest and merit. I think it is important to make this report available to my colleagues in the form of a report from the Committee on Environment and Public Works. It is my belief that we all stand to learn from the efforts Norway has taken to resolve the significant and perplexing problems energy development continues to create for resource-rich areas of the world.

I appreciate your continued interest in disseminating this type of information for the benefit of the Congress and all Americans.

Sincerely,

Mike Gravel

MG/dc

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SOME IMPLICATIONS FOR ALASKA OF PETROLEUM DEVELOPMENT ON THE NORWEGIAN CONTINENTAL SHELF

Department of Geography
and
Mineral Industry Research Laboratory
University of Alaska
Fairbanks, Alaska, 99701

Donald F. Lynch, Ph.D.
Professor of Geography

Nils I. Johansen, Ph.D., P.E.
Associate Professor of Geological Engineering

June 15, 1978

SUMMARY

In January 1978, Senator Mike Gravel travelled in Norway to obtain information on Norwegian reactions to petroleum development on the continental shelf of the North and Norwegian Seas. This report presents some implications of Norwegian experiences which may be relevant to Alaska as developed by two University of Alaska professors who accompanied Senator Gravel and his assistant C. Deming Cowles. Norway has successfully integrated petroleum development with its existing social, political and economic policies. Alaska can and should do the same. Norway's experiences have shown that Alaska needs to pay close attention to petroleum impacts on fishing, sea bed fouling, and to strengthen the capabilities of small communities to respond to petroleum developments. The Norwegian use of chartered fishing vessels for continental shelf surveillance may be worth imitating in Alaska. Norway's approach to environmental controls over its major new Bamble liquid natural gas petrochemical complex may be useful in Alaska. The major current center of oil impact in Norway is Stavanger, which seems to have handled the changes better than Alaska. The Norwegian response to the Bravo Blow-Out was to require all oil companies cooperatively to develop a single, emergency organization capable of quick response in a pollution emergency. This approach may have merit in Alaska. North Norway may in the near future be impacted by continental shelf petroleum development in an environment similar to that of coastal Alaska. The Norwegian experience here should be closely followed for lessons applicable to Alaska.

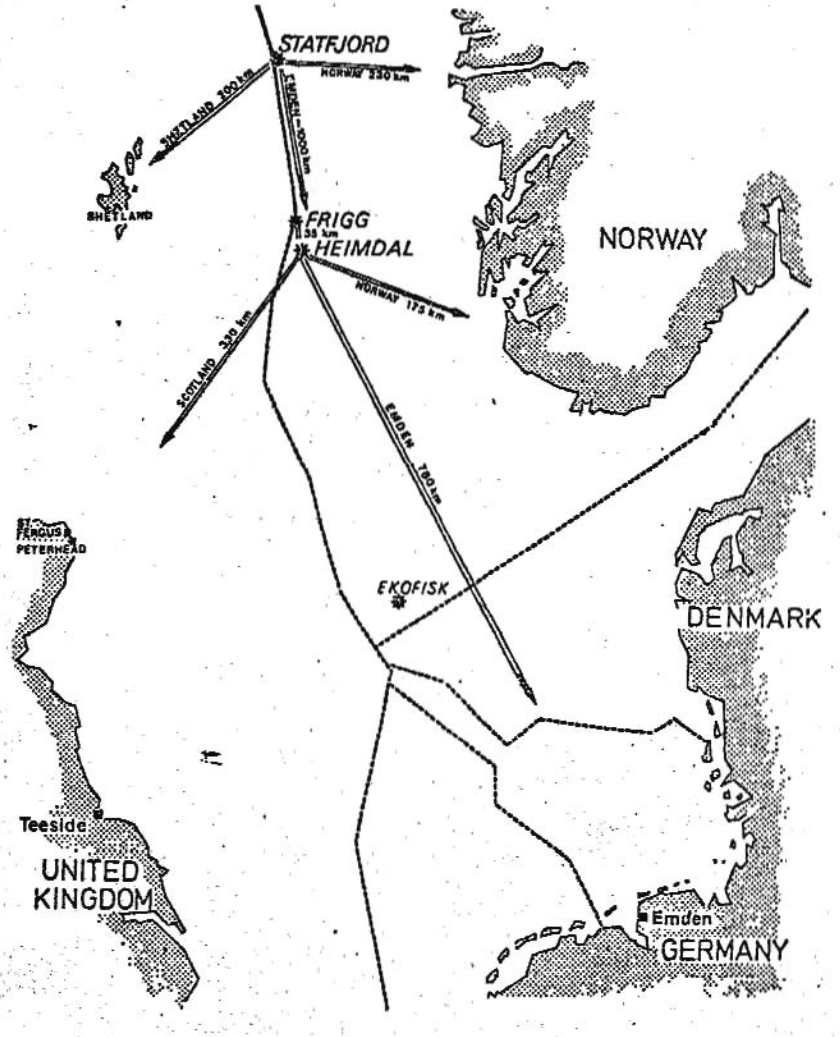

Fig. 1. Geographical location of the Frigg, Heimdal and Statfjord fields.

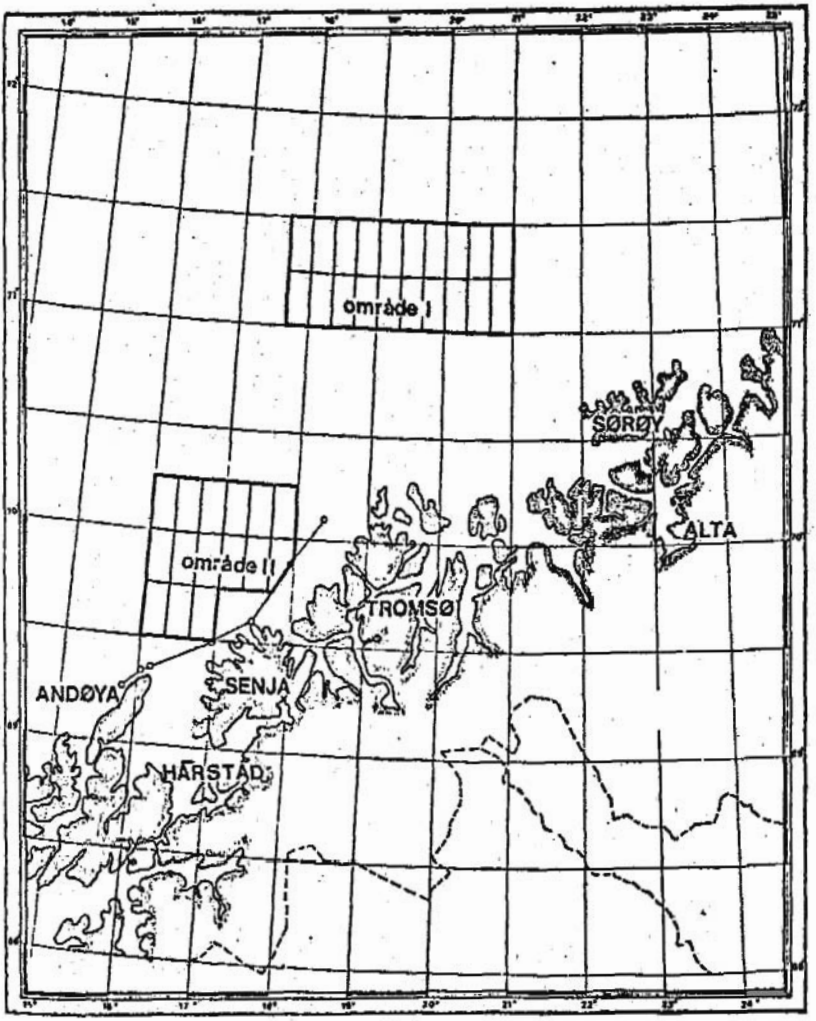

Fig. 8
Area I and II off Troms/Vest-Finnmark, divided into blocks.

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Introduction

U.S. Senator Mike Gravel and his assistant, Mr. C. Deming Cowles travelled to Norway from January 8 - 12, 1978, to review Norwegian experiences in the petroleum development which is occurring at a rapid pace in the North Sea. They were accompanied by Professors Donald F. Lynch and Nils I. Johansen of the University of Alaska, Fairbanks. The purpose of the trip was to collect information on Norwegian experiences with continental shelf petroleum development which may be applicable to Alaska. An extensive amount of recently published information was obtained and used as the primary source material for this report.

U.S. Ambassador Lerner and Counselor for Economic and Commercial Affairs Andrew D. Sens were most kind and helpful in arranging interviews with Norwegian officials. The group met with officials from the Norwegian Foreign Ministry, Ministry of Finance, Ministry of Industry, Petroleum Directorate, Department of Environmental Protection, Statoil, State Pollution Control Authority, Mayor of Stavanger, the Clean Seas Group, and others. Norwegians, both in official and unofficial capacities, were most hospitable and helpful and provided information on all aspects of petroleum development.

The report represents the views and impressions of Dr. Lynch and Dr. Johansen on the relevance and significance of Norwegian experiences to the development of the petroleum resources on the continental shelf of Alaska. The development of policies to guide petroleum activities on the continental shelf is a major concern in the Gulf of Alaska and the recently announced Beaufort Sea leases. The magnitude of future potentials on Alaska's continental shelf is suggested by its simple size: it is larger in area than Scandinavia.

Norwegian experiences, while occurring in a different political, cultural, social and physical environment than Alaska, seem to offer some insights into the types of problems and opportunities which Alaska may face. Some forms of cooperation between Alaska and Norway may prove useful to both, particularly in the areas of socio-economic impacts on coastal communities, marine environmental protection measures, and the role of governmental policies on petroleum activities.

This report is not intended to be scholarly and complete, but rather gives impressions made in an all too brief trip and from reviewing some sixty odd reports. The findings and conclusions are the sole responsibility of the authors, Dr. Lynch and Dr. Johansen, whose travel was funded by the National Science Foundation and the Mineral Industry Research Laboratory of the University of Alaska.

The report first addresses the background of petroleum development in Norway and the current situation, and then discusses the implications of developments in North Norway to Alaska, presents some information on the environmental controls affecting the Bamble petrochemical complex, describes the impressions received on socio-economic impacts of petroleum development on Stavanger, reviews the major conclusions reached in Norwegian studies of the Ekofisk Bravo Blow-Out and offers some concluding comments. A chronology of petroleum development in Norway, references by topics and a bibliography are appended.

The over-riding impression that one receives from examining the Norwegian experience is that, with proper planning, preparation and control, petroleum and natural gas development can provide significant opportunities for social and economic growth and improvements in the quality of life. Norwegian government

and industry seem to have been able to work cooperatively in most areas with major international petroleum companies.

Alaska could learn much from the Norwegian experience particularly regarding the needs of local governments facing the challenges of oil exploration and development, the problems of surveilling and controlling operations on the continental shelf, implications of petro-chemical development, the potential conflicts between fishing and petroleum development, and the integration of petroleum development with established social and political goals.

Background

Petroleum development became important in Norway in the 1960s with the first oil leasing and the beginning of Norwegian construction of mobile drilling rigs. From the late 1960s to the early 1970s, Norway considered the implications of petroleum development and made major policy decisions. These included fostering a vertical domestic petroleum industry including capabilities for exploration, support, construction of drilling platforms and other equipments, development of a petro-chemical industry, support of petroleum related scientific, technical and policy research, and the establishment of a state owned petroleum company, Statoil. In short, Norway quickly acquired marked capabilities to conduct petroleum exploration and development and established the institutional framework for becoming a world exporter of petro-chemical products.

This economic development was paralleled by the establishment of social and political policies designed to effect major social changes involving greater emphasis on the quality of life, human rights, and expanded employment, social and economic equality, and greater participatory democracy. In short, policies were designed to harness petroleum activities in their broadest sense towards the achievement of politically established social goals configured around the concept

of a welfare state.

The economic value of petroleum related activities and revenues has been greater in Norway than in Alaska, although Alaska is at present and probably will remain a larger producer of petroleum than Norway. Norwegian policy has been implemented by stages of establishing state control over petroleum exploration and development. The primary legal instrument has been leasing policy. Where oil leases are auctioned in Alaska, in Norway they are awarded to that company or group of companies which is most able and willing to contribute to the achievement of Norwegian economic and social objectives. The lease system was changed in 1972 to emphasize greater state influence. Negotiations include consideration of the number of wells to be drilled, degree of participation by Statoil, activity rate, the company's financial abilities, safety and performance record, technical and research capabilities, and experience in the North Sea. Each company selected is required to incorporate in Norway and pays a small area fee which remains modest for six years and then increases greatly if exploration activity is not considered satisfactory. Once in production however, the total taxation in petroleum appears to be higher than in Alaska.

The development of Norwegian policy corresponds with the discovery and start of production in the Ekofisk field (1970-1971) and the Heimdal field (1972-1974). The Statfjord field was declared commercial in 1974 and should enter into production in 1978. The Frigg gas field entered into production in 1977. A new phase in petroleum development may be starting at present with the opening of Statoil's office in Harstad, North Norway, and the possible beginning of petroleum exploration in North Norway in two blocks situated offshore from Tromso, in areas considered vital for the fishing industry.

Having developed an industrial capability tied to oil exploration and development on the continental shelf, Norway would seem to have committed itself to further oil exploration. Estimates of production potentials from known fields indicated a decline in production levels in the late 1980s. In short, the potentials known to exist at present appear to have a productive life of only a decade, so that sustained economic growth will depend in large part on moving oil activities northward into unexplored areas. This move appears to be at its initial stage in 1978 and will see continental shelf petroleum development move into geographic environments somewhat akin to those of coastal Alaska. The Norwegian decision to expand off-shore drilling northward seems to be occurring at the same time as Alaska is deciding to initiate petroleum leasing in the Beaufort Sea. Norway, however, is approaching the task with much more political, technical, industrial, and social knowledge than is the State of Alaska. Alaska, on the other hand would seem to have a greater potential for producing oil and natural gas.

CHRONOLOGY OF CONTINENTAL SHELF OIL DEVELOPMENT IN NORWAY

1962	-Phillips Petroleum Company requested a monopoly on oil development in the Norwegian sector of the Continental Shelf
1963	-On May 31, Norway proclaimed its sovereignty over the Norwegian Continental Shelf as regards exploration for and utilization of natural resources
1964	-Establishment of the Continental Shelf Commision
1965	-First petroleum leases given -Establishment of the State Oil Council -First petroleum development permits issued -First contract to Norwegian shipyard to build a mobile oil platform
1966	-First oil and gas drilling in the North Sea -Drilling in Norwegian Continental Shelf began in 1966; 102 holes were drilled by 1973
1969-70	-Geophysical prospecting in North Norway
1968	-Second period of petroleum leases
1969	-First economically significant oil and gas discoveries
1970	-Discovery of Ekofisk Field
1971	-Test production began in the Ekofisk Field -Oil production started at Ekofisk Field
1972	-Statoil founded -North Norway Oil Council established -Heimdal Field discovered; declared commercial in 1974
1973	-Third round of leases
1973-74	-International oil crisis -Period of steepest growth in petroleum activity
1974	-Publication of Parlimentary Report No. 25 establishing Norwegian government guidelines for petroleum development in Norway. Assumed production of 35 million tons of oil and 25 million tons of gas equivalents by 1977 -Oil production reached 28 million barrels (about 3.7 million tons) -Statfjord Field declared commercial

1975 -Monthly oil productions from Ekofisk jumped from about 250,000 tons to 1,115,000 tons

1976 -Monthly oil production from Ekofisk increased to 1,400,000 tons

1976-77 -Use of side looking sonar and underwater television showed extensive debris on ocean bottoms left by oil exploration companies including holes drilled by ESSO

1977 -26 billion kroner ($5.2 billion) balance of payment deficit
-6 billion kroner ($1.2 billion) tax income from petroleum activity in 1978
-Norway's total imports in 1977 exceeded exports by 20 billion kroner ($4 billion). In 1977, petroleum production was 16 million tons of oil and gas equivalents (320,000 barrels per day)
-Bravo Blow-Out
-Production from Frigg gas field
-Bamble petro-chemical complex in operation
-Completion of Statfjord "A", the world's largest off-shore production platform, built in Stavanger

The development and landing of petroleum from The Statfjord Field and a gas trunk-line

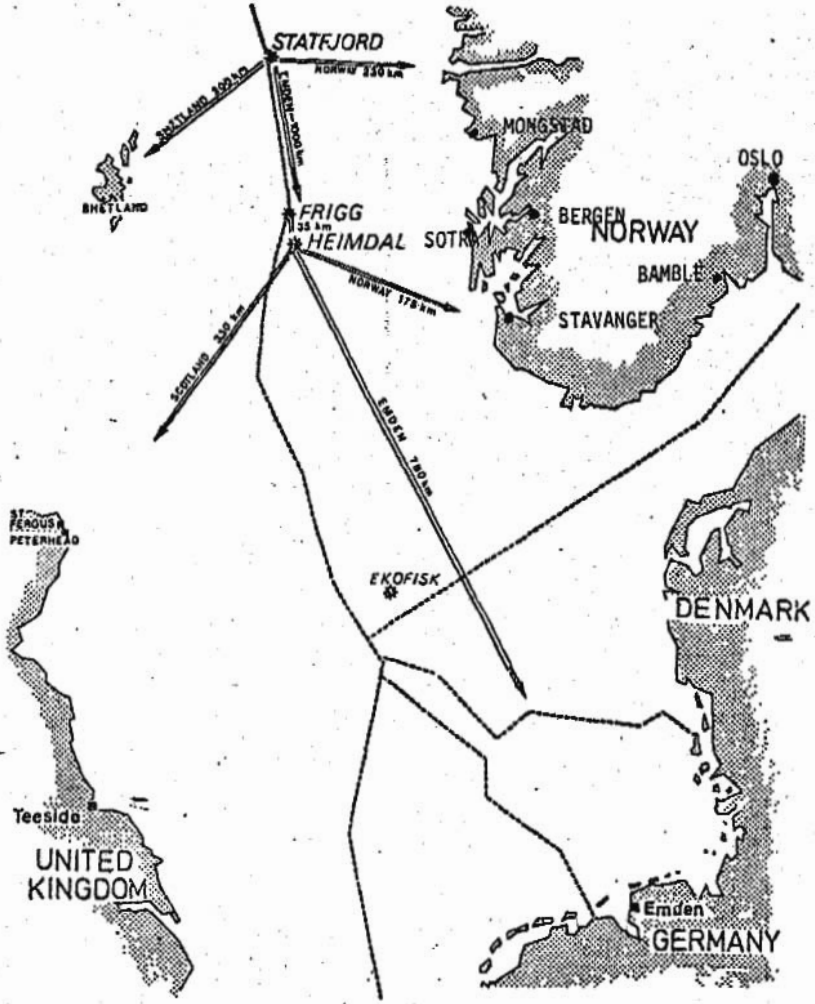


Fig. 1. Geographical location of the Frigg, Heimdal and Statfjord fields.

Norwegian North Sea Petroleum Development

Current Status

Petroleum development on the continental shelf off Norway has been restricted to the area south of the sixty second parallel. Significant drilling north of that latitude has not yet been permitted by the Norwegian government for major policy reasons. Among these has been a desire on the part of the Norwegian government to maintain oil and gas production at a level compatible with the economic needs of the Norwegian economy in order to provide for sustained growth, improvements in the quality of life, and to avoid major social and economic dislocations, particularly in promoting migrations from smaller settlements to major urban areas. In addition, there is fear of a genuine conflict between the rich fisheries along the coast of North Norway and petroleum development. The conflict is viewed as one of potential oil pollution, injury to the trawler fleet from petroleum activities, and possible competition for labor.

Fouling of fishing gear is a real problem because of the amount of material which oil companies have thrown into the sea around drilling platforms. The materials have seriously damaged trawlers' gear. The evidence for the failure of oil companies to follow regulations regarding discarding materials into the sea consists of television photographs, surveillance conducted by side looking sonar and actual materials retrieved from the sea bottom. According to one source, as much as one quarter of the North Sea may be covered with such debris at the present time. The photographic evidence of fouling in Norwegian waters is impressive

The forecasts for petroleum development upon which Norwegian policy has been based originally envisaged a total production of a maximum of 90 million tons of oil and the equivalent in gas by 1980 which is equal to

approximately 1.8 million barrels per day. The Trans Alaska pipeline, by comparison, is carrying 1.2 million barrels per day at present. The Norwegian government felt that production at this rate was more than sufficient and that greater levels of production might encourage, among other things, too rapid a rate of inflation in a country with a population expected to reach 4,000,000 by 1980.

With the publication of a major petroleum policy in 1974, Norway had embarked upon a period of developing oil related industries which brought employment to over 20,000 Norwegians and saw extensive investment in petroleum related activities including shipyards and the Bamble gas refinery designed to produce polyethelenes and vinylchloride for the European plastics industry. The Bamble refinery is based on the use of natural gas liquids obtained from a plant at Teeside, Scotland. The Teeside plant has encountered significant difficulties in construction and is behind schedule. The year 1977 saw Norwegian investment reach an all-time high with the economy operating at full employment in spite of a marked decline in traditional exports and a rapid growth in domestic costs of production, particularly a significant increase in labor costs.

Oil and gas production in 1977, originally forecast at a level of 35 million tons of oil and 25 million tons of gas (in oil equivalents), was only 16 million tons of oil and gas (in oil equivalents). The resultant shortfall in oil revenues and taxes, reduction in anticipated exports and high investments lead to a balance of payments deficit for 1977 of about 26 billion kroner (about $5.2 billion) and a total national foreign debt of about 80 billion kroner (about $16 billion). The Bravo blow-out of April 1977 and other factors caused a delay in oil production. These financial problems lead to the February, 1978 devaluation of the Norwegian crown which was under discussion during the trip to Norway. Fiscal and

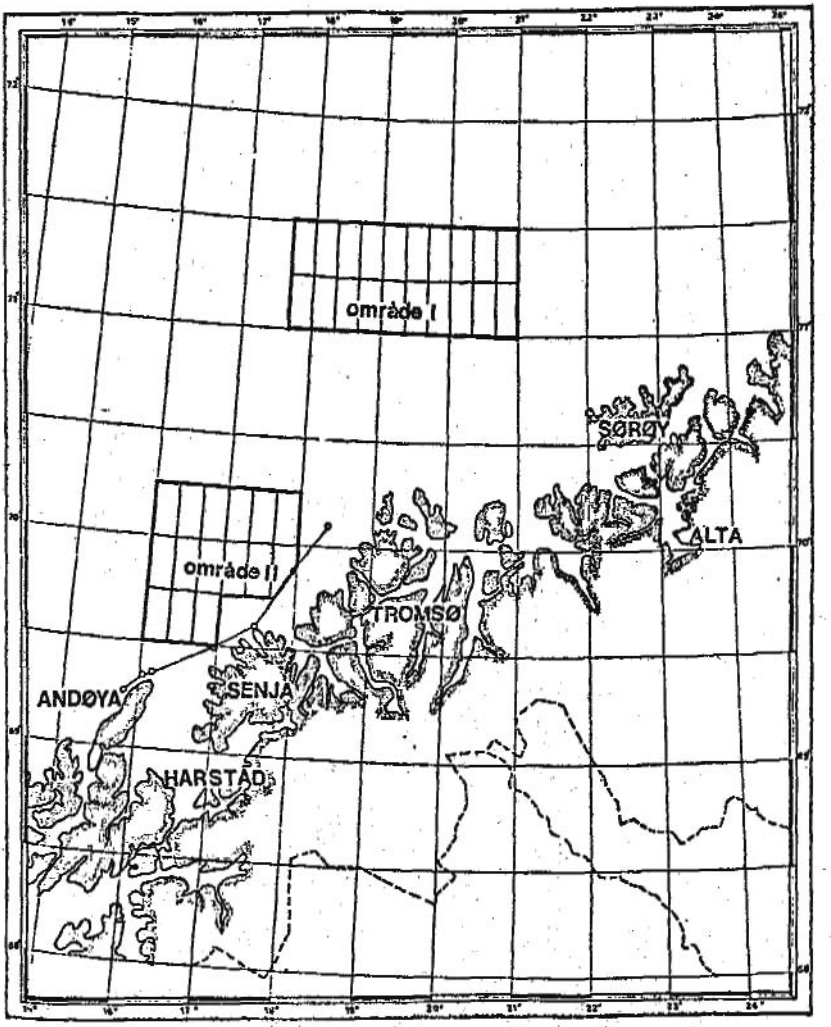


Fig. 8
Area I and II off Troms/Vest-Finnmark, divided into blocks.

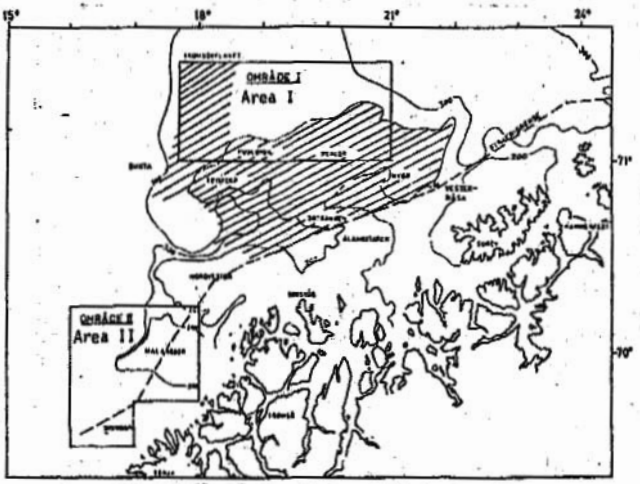
North Norway Leasing Areas

economic considerations would seem to be compelling the government of Norway to open the continental shelf north of the sixty second parallel to oil leasing during 1978-1979 in order to increase the economics benefits derived from Norwegian involvement in oil exploration activities, however the pollution potential as seen in the Bravo blow-out may cause a further delay.

North Sea petroleum developments during the past decade can be instructive in estimating potential impacts of petroleum development on the continental shelf of Alaska. However, the near term development of petroleum in North Norway will more closely approximate Alaskan conditions and should therefore be closely followed.

North Norwegian Oil Development

One of the major difficulties facing petroleum exploration and development in North Norway is that the most promising areas for petroleum lies in some of the most significant fishing grounds found in the Norwegian Sea, as shown below.



Source: The Ministry of Industr and Crafts, Petroleum Exploration North of 62°N, Report No. 91 to the Norwegian Storting, page 56.

Figure 12: Fishing grounds at or near leasing Area 1

Another is the general perception that if commercially significant deposits of petroleum are found, development will follow almost automatically and at a pace which will cause social and economic impacts beyond the capabilities of local governments to handle. The location and impacts of shore installations for both exploration and development are major issues. One significant concern under Norwegian conditions is the possibility that major shore installations and expanded petroleum related employment will lead to a concentration of population in large communities. Official Norwegian policy is to maintain the economic and social viability of small settlements, a policy objective which is probably shared in many parts of coastal Alaska. In the longview, the continental shelf off North Norway probably has a greater petroleum potential than the area south of 62°N. Development could lead to social and economic changes of such magnitude, as to constitute a major turning point in the history of North Norway.

North Norway consists of Nordland, Troms and Finnmark, a region with an area of about 112,000 square kilometers and a population of approximately 450,000 people, stretching along the coast of the Norwegian Sea from a little south of the Arctic Circle to 72 degrees north latitude. In terms of physical geography, this region has similarities in climate to much of Southeastern and Southcentral Alaska, and like western Alaska it is a coastal area heavily dependent upon the products of the sea for its livelihood. The region has shown a marked tendency for people to migrate to the larger settlements in the last two decades and has functioned as a frontier area basing its economy principally on the primary industries (mining, forestry, farming and fisheries) and with a lower level of services and communications than elsewhere in Norway. Nordland has been the one part of Norway to show a marked decline in employment

opportunities during recent years.

Petroleum exploration and development is viewed as a possible solution to the problems of unemployment and depopulation of smaller communities. The desire seems to be for a type of petroleum activity which will maximize economic activities in North Norway by i.a. supporting local industries. One goal seems to be to encourage decentralization of manufacturing and supply activities into smaller communities.

North Norway also has 30,000 Lapps (Samer) who have been to a degree culturally discriminated against in the past. Based on the literature reviewed, the Lapp people seem not to have taken any position regarding petroleum development as a distinct cultural group.

The regional plan for North Norway of 1972 (Landelsplannen, p. 221-222) favors of oil exploration and development, but on a different basis than that followed in Stavanger-Rogaland. Particularly, the plan favors spreading oil related activities into smaller communities making maximum utilization of labor and other local available skills and resources in North Norway. The plan foresaw a need for significant financial support from the central government for building communal infra-structure and services in anticipation of petroleum development.

The regional plan advocated the creation of the North Norway Oil Council which was established in August, 1972, for the purpose of making policy recommendations regarding petroleum development. The Council's role was to be an advisory body for local and central governmental authorities and for public and private oil interests in North Norway (Myrland, p. 23). The Council consists of 9 political members elected by local government bodies and four consultative members representing the Norwegian Fisheries Association.

the Norwegian Trade Union Organization, the Norwegian Association of Employers, and the Norwegian Industrial Society. In addition, major government departments were given observer status (Myrland, p. 30-31).

The North Norway Oil Council has attempted to develop guidelines for petroleum development policies which can be supported by local governments and be utilized as a basis for broad public discussion. In this fashion, the Council also functions as an information service on petroleum policy problems that may affect North Norway.

One disputed conclusion that the Council has reached, based on data from South Norway and Great Britain, is that labor is not transferred from the fisheries, farming and forestry sectors to petroleum activities, so that fears of petroleum development destroying basic industries may be unfounded (Cf. Vallestad, p. 17; Reiersen, pp. 13, 16). It has recommended that in general the state should control and direct petroleum development by selecting companies and controlling leasing, that environmental controls should be established, and that there should be the fewest possible negative social effects of petroleum development. The Council recommends that local governments do their own socio-economic impact analysis and planning and that they be given sufficient time and resources to do so (Nord-Norsk Oljeraad, 23 May 1977). The last point appears to be particularly important as experience suggests that local governments usually have neither the time nor the capabilities necessary to plan adequately for the impact of petroleum development. This same point is stressed by John Sewel regarding communities in Scotland.

The literature reviewed on North Norway and the impressions received during the trip suggest that the government least able to plan for and cope with impacts of off-shore petroleum development is at the local level. The North Norwegian Oil Council seems to fulfill a needed role as an advisory body to

both local and national governments, and its recommendation that local governments' planning and research capabilities be considerably strengthened in advance of petroleum exploration may be very appropriate for coastal Alaskan communities as well .

Petro-Chemical Industries (Bamble)

Norway has a well-rounded economy with a significant manufacturing sector and industrial labor force, unlike Alaska which is heavily based on primary and tertiary economic activities and has only limited secondary industrial development. Of the many reasons behind this difference, one has been the strong emphasis in Norway on energy production and most particularly the large-scale development of hydroelectric power and policies designed to support mining, mineral and chemical industries, processing of agricultural, forestry and fishing products, and a ship building industry tied to one of the world's largest merchant marines. Norway has attempted in many sectors of its economy to utilize and develop advanced technology. Approximately one half of Norway's total energy needs comes from hydroelectric power, while in addition Norway has three refineries producing both for the domestic and a significant foreign market. Based on this background of knowledge and experience, the Norwegian government has supported a significant expansion of the petro-chemical industry with a view towards developing a major export capability.

The resulting project involves an investment of approximately one billion dollars by Norsk Hydro, Saga and Statoil in a petrochemical complex at Bamble based on natural gas liquids and able to produce 300,000 tons of vinyl chloride, 100,000 tons of high density polyethylene, 40,000 tons of low density polyethylene and 50,000 tons of polypropylene per year. Construction of the Bamble plant, located at Rafnes near Porsgrunn, commenced in 1974. Pollution in the Porsgrunn-Skien

area must be less when the Bamble plant is operational than it was before. In short, the additional pollution from Bamble can be offset by decreasing pollution from other sources. A detailed study of environmental conditions prior to the commencement of construction was undertaken.

The Porsgrunn-Skien region is physically somewhat like Prince William Sound and Cook Inlet, and the general characteristics of the Bamble plant seem similar to some of the proposals for a petrochemical complex in Alaska. The results of the Bamble project would be worth assessing before a similar project is undertaken in Alaska both from an economic and an environmental viewpoint. The concept of establishing overall regional norms for acceptable pollution levels and then allowing an increase in pollution from one activity to be offset by a decrease from other activities may be worth consideration at least in the Fairbanks area, with its chronic winter ice fog problem.

Comments on the Impact of Petroleum Development on Stavanger

To someone accustomed to the newness of Alaska's towns, it always comes as a bit of a suprise to visit a city whose origins go back to the twelfth century. Stavanger, a beautiful city in southwest Norway, is such a settlement, one that enjoyed significant growth in the nineteenth century as a center for the fishing industry and in particularly canning sardines. In the post World War II period, the city of Stavanger has seen its population increase from about 50,000 to approximately 87,000. It became the center for oil development on the Norwegian continental shelf and enjoyed a population growth of 10,000 in the last decade. The general Stavanger-Rogaland region today has a population of about 176,000. In recent years population growth has been about 0.8% in the city and 1.4% annually in the surrounding region. Oil activities employ about 7,600 of the total Stavanger labor force of 37,000. Approximately 1.7 to 2.0 jobs are created to support

each oil related job when new development is involved. In the past, one support job was created for each new oil related job. There are approximately 1,300 foreigners in oil related positions in Stavanger. With dependents, the number of foreigners is approximately 5,200 of whom about 44% are believed to be Americans.

We encountered some disagreements as to the magnitude of the social problems which have occurred in Stavanger due to the impact of petroleum activities. One official felt that the problems of crime and drugs were less in Stavanger than in other Norwegian cities and that in general the problems of cultural inter-action between the foreigners and Norwegians had been handled rather well. Others argued that the impact of drugs, alcohol and high petroleum wages had created serious problems of social change. Americans in Stavanger seemed to be the object of some criticism.

One very significant difference between Norway and the United States is that Norwegian local governments have strong administrative controls over housing, settlement patterns and land ownership. Stavanger has deliberately spread foreign families throughout the city in order to avoid the creation of foreign concentrations and consequent problems. Foreigners are not allowed to purchase housing without special permission and foreign companies are not permitted to purchase land. In addition, the government of Norway has various legal controls over the movement of foreigners and their activities which could not be applied in the State of Alaska against people from the other states. As a general impression, it seems that the government of Stavanger has been able to take more stringent measures in controlling problems of social behavior that would be acceptable in Alaska due to the differences in political and cultural systems. Many of the problems and complaints encountered could be ascribed to social and economic trends, general trends in costs of living and inflation, and other factors consequent

upon growth that are in many ways independent of the particular causative force.

Stavanger, with a population of 87,000,has a police force of 197 uniformed personnel. The Fairbanks North Star Borough, with a total population of almost 70,000 is served by approximately 95 city police and State Troopers.

Continental Shelf Surveillance, the Bravo Blow-Out and Pollution Control

Alaska's continental shelf has an area somewhat larger than that of the state itself and comprises the largest continental shelf adjacent to any state in the Union. The Norwegian continental shelf is approximately three times the size of the land area of Norway. Both Norway and Alaska face major tasks in providing surveillance over activities on their continental shelves. The difference, of course, is that the jurisdiction of the State of Alaska is limited and the primary responsibility for surveillance is vested in the Federal Government. The effects of pollution however, will damage Alaska's interests.

Norway is just beginning to establish a coast guard and its military capabilities are most modest. Surveillance of fisheries activities has been conducted by and large with the use of chartered vessels. Proposals to establish a coast guard with wide-ranging responsibilities over fisheries, petroleum activities, pollution, sea bed fouling, etc., envisage creating an interim capability with the use of chartered civilian vessels and crews commanded by a naval officer and with naval gun crews (Parlimentary Report No. 81, pp. 4, 9). Police responsibilities are to be divided among coastal police headquarters (as appears to be the case in Stavanger) with a strong recommendation that the person in charge of an oil installation on the continental shelf be accorded the same powers as a ship's master including the "use of force if necessary to secure obedience" (Report 81: p. 7). In addition there is also a proposal to create a special marine

commando section to provide assistance in combatting major terrorist activities on the continental shelf. There may be some merit from Alaska's viewpoint in considering the Norwegian proposal to use charter vessels from the existing fishing fleet for surveillance of continental shelf operations and also for use in pollution clean-up activities. In addition, the impact of continental shelf petroleum development on local police and the Alaska State court system should be carefully taken into account.

The need for improved surveillance over petroleum activities has become obvious in Norway due to the clear evidence of sea bed fouling and the Bravo Blow-Out of April, 1977. The Bravo Blow-Out occurred because of a failure in the installation of blow-out preventers during a major overhaul operation. The Norwegian investigation committee which analyzed the blow-out found that the underlying cause of the accident was inadequate organizational and administrative systems and highlighted the fact that the personnel involved, in spite of long experience, lacked the theoretical education required for such positions under Norwegian regulations for mobile platforms (Bravorapporten, p. 8). The committee also found that the reports, diagrams and other forms of documentation regarding the drilling operation were inadequate (Bravorapporten, p. 37-38). The lack of documentation "lead to a major mistake in the planning and later approval of the workover procedure" (Bravorapporten, p. 90).

The blow-out occurred on the Ekofisk B, Bravo, platform operated by Phillips Petroleum Company Norway on April 22, 1977. Phillips had not yet developed emergency plans for such a contigency as required under the Norwegian regulations of July 9, 1976. In addition, no national emergency plan existed either, and the Norwegian action group established to coordinate emergency measures found itself lacking any real knowledge of how to handle an uncontrolled blow-out. The

blow-out was capped by Phillips with the assistance of Red Adair on April 30, 1978. The Norwegian action group, while critical of Phillips on some points, found no grounds for objecting to the manner in which the capping operation was conducted (Aksjonsledelsens rapport; p. 7, 8, 11).

Altogether about 25 vessels and 200 personnel were involved in the oil clean-up operation at sea which recovered 870 tons of oil. The Norwegian action group refused to allow the use of chemical oil dispursants except in the area near the platform. The limited use of dispursants did not lead to any environmental damage. The clean-up operation was improvised as there was a shortage of personnel with the experience and equipment necessary (Aks. led. rap: p. 12). Total environmental damage was slight due largely to favourable weather and sea conditions. The Norwegian action group found that "all in all it could be said that one could not have been more fortunate from an environmental protection viewpoint." (Aks. led. rap: p. 13) Among the major factors involved here was the location of the blow-out about 175 miles from the nearest coastline and the absence of birds, fish or other life in the polluted area (Aksj. led. rap: p. 12-14). The significance of favourable weather and sea conditions on the evaporation of hydrocarbons has been highlighted in an Exxon study which further estimates that petroleum production operations contribute only five percent of the total hydrocarbons present in the North Sea.

Interviews with individuals involved in the Bravo Blow-Out emergency, films shown and the reports available suggest that the tempo of preparations to handle such an event was unsatisfactory. The planning and preparations which commenced in 1976 were not sufficiently developed to meet the actual situation which occurred in April of 1977. In addition, the actual pollution and damage that might have resulted could have been significantly worse under different weather

and sea state conditions or under the circumstance that the platform was located closer to shore and in a major fisheries region. The lesson for Alaska is that both plans and capabilities to prevent significant spills and to minimize the probable damage should be developed before and not after the emergency.

The Norwegian State Pollution Control Authorities have established requirements for anti-pollution preparedness and have approved the creation of a separate organization financed by the petroleum companies operating in the North Sea to handle pollution problems. The government has established the design and operational objectives, but the petroleum companies themselves have been given the clean-up responsibility. The organization, visited in Stavanger, is named the North Sea Operators Committee - Norway: Clean Seas Group and is funded by Phillips (52%), Nordsk Hydro and Esso (7% each), Statoil (6.4%), Mobil and Conoco (5% each), Amoco and Elf (4% each), BP (3%), Shell and Saga (2% each), and Union Oil and Gulf (less than 1% each). This arrangement is viewed as more satisfactory than requiring each individual company to maintain its own emergency preparedness facilities while keeping the responsibility for clean-up operations vested in the petroleum companies rather than in a government agency.

The government's objectives are that the Clean Seas Group must have a capability to clean up 8,000 tons of oil per day under an ocean current speed of 1.5 knots. South of 62°N the emergency equipment must be activated within 48 hours, while north of 62° the activation period required is 24 hours. Wave height conditions specified are 2.5 meters south of 62° and 3.0 meters north of 62°.

The Clean Seas Group has at its disposal six dedicated supply boats, 3,000 meters of booms and specially developed skimmers designed specifically for North Sea sea state conditions. The Framo and Thune Eureka skimmers cost $100,000 to 150,000 apiece, operate by gravity separation of surface oil from

water, and in the films viewed showed a marked capability to operate under difficult sea states.

The six dedicated vessels are normally used to supply oil operations but have a first priority for emergency use. The Clean Seas Group felt that this was a better approach than building and maintaining special purpose vessels. Statoil was said to be considering using fishing vessels to hold booms in place for operations in North Norway. Evidently trawlers and purse seiners with bow thrusters are suitable under the anticipated sea state conditions.

The concept of requiring the petroleum companies to develop their own organization and cooperative plans for emergencies under the approval of responsible government agencies may have applicability on the Alaskan continental shelf. The approach places responsibility on the petroleum companies with the advantage that a special purpose organization is created which should be able to cooperate well with its owner companies. Additionally, the concept of using existing fishing and supply vessels with a dedication to emergency use might be applicable in Alaska.

The people of coastal Alaska are very much sea oriented, have extensive experience in fishing and other maritime endeavors, and good reason to be somewhat fearful of environmental pollution and possible harmful effects of petroleum development on fisheries. Involving them in an organization capable of reacting effectively to pollution problems might be quite advantageous to the State and to the petroleum companies. Norwegian experience here seems applicable to Alaska.

Some Concluding Comments

The travel in Norway and the reports consulted concern basically governmental policies and concerns. One of the central themes, perhaps best illustrated by the Bravo Blow-Out, is that continental shelf activities require administrative organizations that can react at a pace compatible with that of the petroleum

development itself. Government organizations, particularly at the local level, seem inadequately supported and structured both to anticipate events and to react within the necessary time frame.

The planning process, which seems much farther advanced in Norway than in Alaska, has some basic weaknesses, one of which is the inability to develop accurate economic forecasts. The rate of petroleum activities, the boom-bust element, changing world economic conditions, and other factors create an uncertainty factor which in some respects appears unmanageable. Where Norwegian planning appears to have been most successful is in establishing general policy goals both for popular discussion and as guidelines for action by administrative organizations.

One element in the impact of petroleum developments stands out clearly: the impact is greatest at the community level, where the resources (both in administration and finances) are least adequate. In this regard, the smaller communities of coastal Alaska would appear to be weaker than those of North Norway. Following a strategy of attempting to isolate local communities from shore based petroleum activities may make sensible planning impossible and in the long term could prove impossible to implement (Mackay: p. 73). A policy of contolled integration may prove better particularly when the shore base is in a large community like that of Stavanger, but would more likely be impossible in smaller communities.

Another alternative is to establish a "deliberate policy... to use oil related developments as part of a process aimed at achieving major economic and social change" (Sewel, p. 90). This appears to be the general policy of the Norwegian government at the national level. As far as North Norway is concerned, however, there appears to be developing a policy or strategy which attempts controlled integration at the regional level with some elements of major economic and social change. The latter seem to seek greater economic stability while preserving the

existing settlement pattern and improving the quality of urban services. Should major petroleum developments occur on the North Norwegian continental shelf, however, such a strategy may prove untenable. The uncertainty factor regarding the probable course of developments contributes to a certain uneasiness about the general policy direction regarding North Norway. This is suggested in some studies from the Social Science Institute of Tromsø University and particularly by the opposition of fisheries organizations to any test drilling.

Norway now enjoys some genuine advantages in considering petroleum related impacts. These include an integrated society, a developed infra-structure, an industrial and research base capable of participation in oil related problems, clear sovereignty over the national territory and the opportunities to review the experiences of the British sector of the North Sea. By comparison, the State of Alaska which lacks sovereignty over most of the area of Alaska, is politically, technically and economically much weaker. Yet, it is the State which will face most of the burdens of petroleum development on the Alaskan continental shelf, a factor which should weigh heavily in the decision-making process concerning petroleum development.

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North Norwegian Oil Development

The relationship between fisheries and petroleum exploration is best shown by Fig. 12, page 56, in: Petroleum Exploration North of 62°N, Report No. 91 to the Norwegian Storting (1975-76). Two areas, called region I and region II have been selected for possible exploration. Region I, north of Tromsø, includes portions of a major fishing area and is surrounded on two sides by rich fisheries. The

Norwegian Fishermen's Association has been seriously concerned about the effect that oil exploration and development may have on North Norwegian fisheries. See Report No. 91, p. 90. Uncertainty over the possibility of oil spills and sea bed fouling seems high. See Nord Norsk Oljeraad, Sikkerhets- og Forurensingsmessige Sider ved en Petroleumsvirksomhet paa Nord-Norsk Kontinentalsokkel, Conference in Harstad, Feb. 1976.

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North Norway

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Continental Shelf Surveillance, the Bravo Blow-Out and Pollution Control

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Data on the Bravo Blow-Out taken from: Bravorapporten Ukontrollert utblaasing paa Bravo 22, April 1977, Universitetsforlaget, October, 1977. The amount of pollutants released is estimated to have been about 2,800 tons of oil and 1.5 million cubic meters of gas per day. About 40 percent of the oil immediately evaporated because of its high temperature of 75°C. Of the total of about 12,700 tons which covered the sea, about half evaporated within twelve hours, after which evaporation rates decreased (p. 10). Clean-up operations removed about 870 tons of pure oil (p. 12).

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Some Concluding Comments

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