

Greenland — Its Economy And Resources

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ABSTRACT. This paper describes the development in Greenland toward greater autonomy, presenting economic statistics and what is known about the extent of its mineral deposits and energy resources. Until 1953 Greenland was a Danish colony. In 1953 it became a Danish county, and on 1 May 1979 it obtained home rule. In early 1985 Greenland left the European Economic Community (EEC). During this period Greenland obtained increasingly greater political autonomy. Up to World War II access to Greenland was greatly restricted by Denmark. Since World War II Greenland has developed a local national economy, characterized as small, mixed and vulnerable, with a big public sector and comprehensive foreign trade — an economy with strong growth, considerable inflation, the beginnings of unemployment problems and extreme dependence on capital inflow from Denmark and use of Danish skilled labour.

As well, the population has been growing. In 1953 it was 25 000, of which 94% was born in Greenland. In 1985 it amounted to 52 000, 80% born in Greenland.

Key words: Greenlandic economy, Greenlandic trade, Greenlandic education, Greenlandic labour force, Greenlandic resources, political development in Greenland, European Economic Community and Greenland

RÉSUMÉ. Ce dossier traite du développement au Groenland vers une autonomie plus grande et il donne des chiffres de l'économie du Groenland et un aperçu de ce que l'on sait de l'existence des dépôts minéraux et des ressources de l'énergie dans ce pays. Le Groenland avait le statut d'une colonie danoise jusqu'en 1953. Cette année-là le Groenland est devenu un département danois et le 1^{er} mai 1979 le Groenland a obtenu l'autonomie. Au début de 1985 le Groenland a quitté la Communauté Économique Européenne (CEE). A la suite de ce développement politique le Groenland a obtenu de plus en plus une autogestion plus grande. Jusqu'à la deuxième guerre mondiale le Groenland était un territoire fermé. Depuis la deuxième guerre mondiale jusqu'à présent le Groenland a développé une économie nationale, locale que l'on peut définir comme une faible économie peu homogène et vulnérable avec un grand secteur public et un commerce extérieur d'importance, une économie en voie d'une forte croissance mais avec une inflation considérable et le commencement des problèmes du chômage. L'économie est extrêmement dépendante de capitale du Danmark et l'emploi d'ouvriers danois qualifiés.

De plus, la population a augmenté. En 1953 la population était de 25 000 dont 94% était né au Groenland. En 1985 la population était de 52 000 dont 80% était né au Groenland.

Mots clés: économie du Groenland, commerce extérieur du Groenland, éducation au Groenland, force de travail au Groenland, ressources du Groenland, le développement politique au Groenland, et les relations entre le Groenland et la Communauté Economique Européenne

Р Е З Ю М Е

В этой работе исследуется процесс развития в Гренландии всё большей автономии, даются данные по её экономике и оценка выявленных запасов полезных ископаемых и энергетических ресурсов. Вплоть до 1953 г. Гренландия имела статус датской колонии. В 1953 г. она стала частью Дании, а с 1 мая 1979 г. получила статус самоуправления и в начале 1985 г. вышла из ЕЭС. Благодаря такому политическому развитию Гренландия получала всё большую независимость. До Второй мировой войны она была закрытой территорией. За послевоенный период в Гренландии развилась национальная экономика, характеризующаяся неоднородностью и уязвимостью, с преобладанием общественного сектора и обширной внешней торговлей. Это быстро развивающаяся экономика, подверженная значительной инфляции, с возрастающими проблемами безработицы и довольно сильной зависимостью от притока капитала из Дании и использования её квалифицированной рабочей силы. Население Гренландии также увеличивается. В 1953 г. оно составляло 25 000 человек, из них 94% родилось в Гренландии. В 1985 г. оно достигло 52 000, из которых 80% — коренное население.

PHYSICAL OVERVIEW

Greenland is the world's largest island, covering approximately 2 200 000 km² (Fig. 1). It is part of the North American

continent and is separated in the north from Canada only by the Nares Strait, a mere 26 km wide. The most northerly point, Kap Morris Jesup, is at 83°40.5'N latitude, less than 700 km from the North Pole. The most southerly point, Kap Farvel, is at

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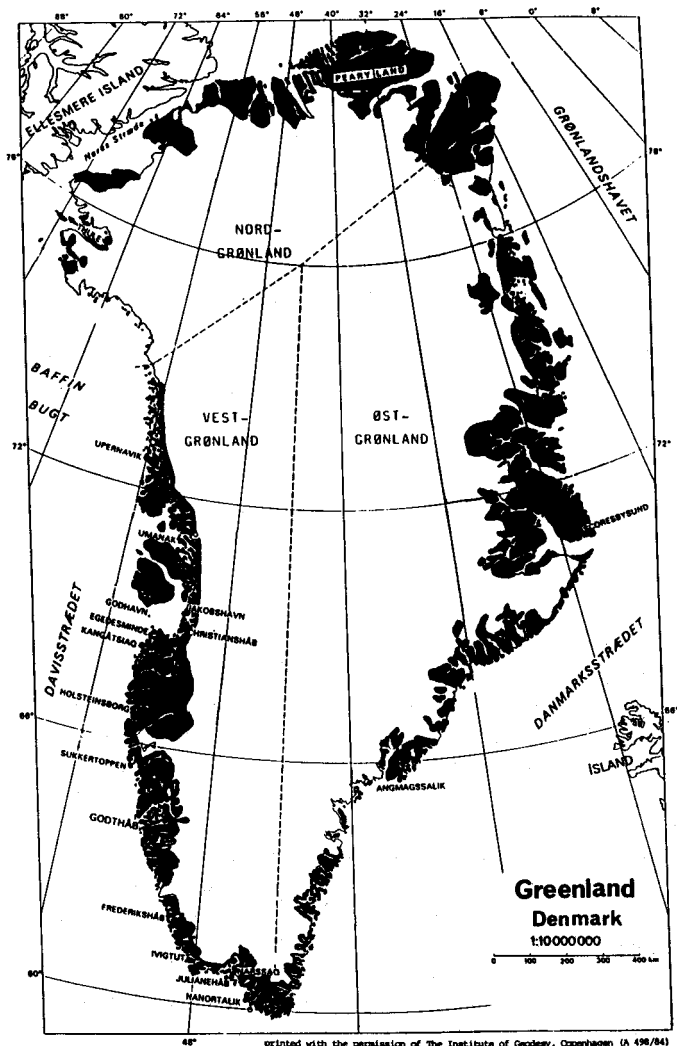


FIG. 1. Map of Greenland.

59°46'N, approximately the same latitude as Oslo, Churchill and Anchorage.

Most of Greenland is covered by an icecap, the so-called "inland ice." In some places the ice is up to 3400 m deep. Only about 380 000 km² of the total area of Greenland is free of permanent ice.

The oldest rocks in Greenland were deposited and folded during the Precambrian age (4500-850 million years B.P.), with the pre-Ketilidian and pre-Nassuttoqidian belts as the core. The Precambrian mobile belts have been a stable block for millions of years and contain the oldest rocks ever found. The North Greenland and East Greenland fold belts were formed later, about 400 million years B.P.

At the beginning of the Tertiary period (about 70 million years B.P.) volcanic activity occurred in both West and East Greenland, and at the end of the Tertiary period (about 3-4 million years B.P.) the "inland ice" began to form.

Climate

The whole of Greenland lies within the arctic climatic zone, which is defined by the warmest month having a mean tempera-

ture of less than 10°C. Winter temperatures play no part in the definition of climate zones, and temperatures considerably lower than those of Greenland are recorded in several places situated in temperate zones.

In the southwest of Greenland meteorological conditions vary greatly with annual fluctuations of temperatures, in the same way as in Denmark, although at lower absolute levels and with high precipitation rates occurring frequently. During the winter half of the year strong gales blow, and the summer months are characterized by frequent fogs, often in the form of freezing fog, which is both cold and dense. In the fjords conditions are of a more continental character, but during the winters strong local gales are common. Wind speeds of 100 knots frequently occur and winds up to 180 knots have been recorded in West Greenland.

Northwest and northeast Greenland suffer from large temperature fluctuations, with temperatures extremely low in the winter. Precipitation is slight — Pearyland, for example, is an arctic desert. The average wind force is rather low, and strong gales are rare.

Because of the drifting polar ice, summer temperatures in East Greenland are considerably lower than in West Greenland, but again conditions in the fjords are more continental. Precipitation levels are high, in the southern part inordinately high, with many days of precipitation. Wind conditions are subject to sudden variations, with squalls occurring around the fjords.

The impact of the ocean circulation can be illustrated by comparing the climate of the northwest coast of Norway with that of East Greenland. The former, thanks to the warm Gulf Stream, has a mild Atlantic climate, while East Greenland has a true arctic climate due to proximity of the cold East Greenland Current, even though the latitude of southern Greenland is similar to that of southern Norway.

Significant climate variations have been observed in Greenland within the last few generations, generally characterized by a heating in the first part of the present century, with a temperature climax in the thirties, followed by a cooling that led to a temperature minimum around 1970. The most characteristic variations are observed in Upernavik, where the average July temperature was 5.6°C in the period 1874-1980. The minimum July average was in 1917, at 4.3°C, while a maximum of 7.0° occurred in 1934 and a new minimum in 1968 at 4.6°C. Within the period under investigation, the amplitudes between maximum and minimum temperatures were less pronounced at Jakobshavn, Godthåb and Angmagssalik, varying from 2 to 3°C.

The cooling trend observed in Greenland since 1960 is not a local but an arctic phenomenon, most clearly observed at the Barents Sea. The seas, of course, have a substantial influence on the climate conditions, mainly due to their currents transporting considerable energy over great distances. Furthermore, water has a great damping effect both daily and yearly on temperature variations.

RECENT HISTORY

Prior to World War II Greenland was a closed area. Permission from the Danish government was required for visits to Greenland, and very few authorizations were given.

During the war the connection with Denmark was interrupted, and the United States supported Denmark by taking over the supply and defence of Greenland. Thereby, the Greenland-

ers were exposed to the outside world through the American military presence.

After the war Greenland's colonial status underwent a radical revision. By an amendment to the Danish Constitution in 1953, Greenland became a Danish county, enjoying equal status with the rest of the kingdom. Since then many efforts, in agreement with the local Greenlandic assembly, have been made to develop Greenland into a modern society. This has been based on the work of the Commission for Greenland (1948-50) and on reports from a new Commission for Greenland in 1960, both established by the Danish Parliament. Since 1955 Greenland has been administrated by the Ministry for Greenland, located in Copenhagen, via a governor in Godthåb/Nuuk, the capital of Greenland.

Prior to the introduction of Home Rule in May 1979, Greenlandic councils (Central Council and the councils for the municipalities) had a consultative status. Until 1979 members of the Greenlandic council were mostly elected as private persons rather than as members of political parties. In the 1960s the Inuit party was founded, pledged to get rid of the "birthplace criterion," but no party members succeeded in being elected to the Danish Parliament or the Greenland Council. The "birthplace criterion" had been introduced in 1964, giving people born in Greenland approximately 85% of the salary paid to Danes for doing the same job in order to increase the Greenlanders' competitive power. With Home Rule political parties became a reality. Today three parties are represented in the Greenland Assembly: the centrist Atassut, the socialist Siumut and the extreme socialist Inuit Ataqatigiit parties. The center and socialist parties are the largest, almost of equal size, while the extreme socialist party is very small.

THE HOME RULE ACT

Home Rule for Greenland came into force on 1 May 1979, stating that the Greenlandic Home Rule Authorities shall exercise legislative and executive power in those fields transferred to Home Rule and assume responsibility for expenditures associated with them. Furthermore, it states that the central authorities of the Realm, after negotiation with the Home Rule Authorities, can transfer to the Home Rule Authorities regulatory jurisdiction for and administration of activities not transferred initially. Subsidies to be paid to the Home Rule Authorities in such fields will be fixed by the Danish government.

In accordance with the Home Rule Act, the Danish governor in Nuuk was replaced in 1979 by a commissioner appointed by the Danish government who is responsible for operations not transferred to the Home Rule Authorities. By the beginning of 1986 most of the domestic fields under the national Danish government were transferred to Home Rule.

The most important field not transferred is health. In foreign relations and the defence of the Realm, the Realm still has jurisdiction. With respect to natural resources, including sub-surface resources, the Home Rule Act established that the resident population of Greenland has fundamental property rights. In order to safeguard the rights of the resident population with respect to non-living resources and also to protect the "interest of the unity of the Realm," these are to be regulated by agreement between the Danish government and the Greenland Assembly, with both having the right of veto. The Home Rule Act established that Greenlandic will be the principal language,

while Danish must also be taught. Either language may be used for official purposes.

THE EUROPEAN ECONOMIC COMMUNITY

In 1973 Denmark became a member of the European Economic Community (EEC). Since Greenland at that time had no home rule, it entered the EEC despite an overwhelming local objection to membership. After home rule was introduced, the Greenland Assembly held a referendum on EEC membership in February 1982. Fifty-two percent of the electorate voted against continued membership (Table 1), and difficult negotiations began, resulting in Greenland's withdrawal from the EEC.

TABLE 1. Voting results (%) in Greenland's referendums on EEC membership, 1972 and 1982

	For	Against
1972	28.5	68.9
1982	46.1	52.0

As of 1 January 1985 Greenland withdrew from the EEC, holding the status of Overseas Countries and Territories (OCT). The OCT Agreement gives Greenland's fishery products access to the Community in exchange for a satisfactory agreement on Community access to Greenland's fishery waters. The protocol of the EEC negotiations, which covers fishing activities until 31 December 1989, grants annual quotas as shown in Table 2.

In addition to the annual quotas, Greenland will allow EEC catches of the species specified in Table 3 toward establishing a balance between the reciprocal possibilities of Community and the Faroe Islands, as provided for in the EEC/Faroes Fisheries Agreement. In return, the Community will compensate Greenland with 26.5 million European currency Unit (ECU) a year. If the Community is granted and uses additional quotas, this amount will be adjusted proportionally.

TABLE 2. Annual Greenlandic fish quotas in tonnes

	Western stock NAFO	Eastern stock ICES
Cod	12000	11500
Redfish	5500	57820
Greenland halibut	1850	3750
Halibut	200	—
Shrimp	1300	3050
Catfish	2000	—
Blue whiting	—	—

NAFO: Northwest Atlantic Fisheries Organization

ICES: International Council for the Exploration of the Sea

TABLE 3. Additional annual quotas to EEC in tonnes

	Western stock NAFO	Eastern stock ICES
Shrimp	475	675
Greenland halibut	150	150
Redfish	—	500
Capelin	—	10000

NAFO: Northwest Atlantic Fisheries Organization

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ECONOMY

Population Distribution

On 1 January 1984 there were 52 347 people in Greenland, of whom 80% were Greenlanders and the rest mostly Danes. At the beginning of 1953, when Greenland became a Danish county, the population in Greenland was only 24 763, 94% born in Greenland. Thus since 1953 there has been an immense increase in population (Fig. 2), including a rise in the number of non-Greenlanders living in Greenland. This population increase has resulted in a society where the average age is relatively low: on 1 January 1984 the average age for Greenlanders was 26.3 years, for non-Greenlanders 30.5 years, and combined 27.3 years (Table 4).

The habitable area of Greenland is restricted, since only about 15%, 380 000 km², of Greenland is free of permanent ice. The population lives in 130 towns, settlements and stations unconnected by road and scattered along 15 000 km of more-or-less accessible coastline. There are 18 municipalities (15 in West Greenland, 2 in East Greenland and 1 in North Greenland), as well as areas "outside the municipalities," such as defence areas. Most of the population live in West Greenland. Twenty percent resides in the capital of Godthåb/Nuuk, 57% in the other 17 towns, 20% in 108 settlements and 3% in 8 stations and in areas outside the municipalities. This population is

scattered and of low density — 0.2 per km² exclusive of the icecap area (Table 5).

Each settlement consequently functions as a relatively closed economy, often with more connection to the outside world than

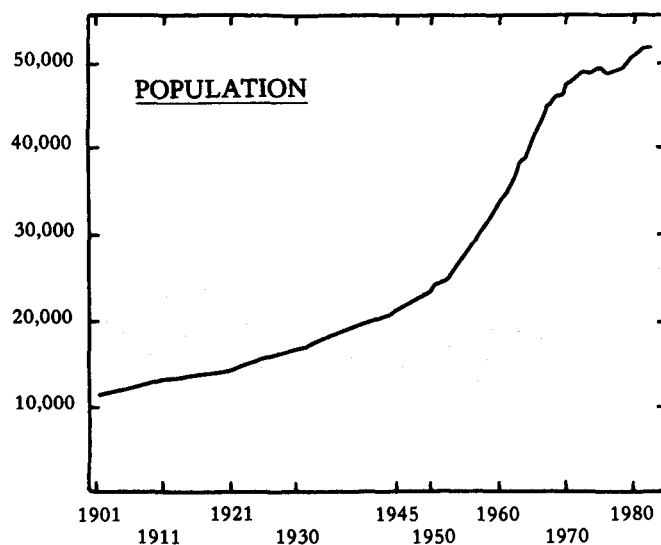


FIG. 2. The population in Greenland, 1901-84.

TABLE 4. The population in Greenland on 1 January 1984 by sex, nationality and age

Age	Greenlanders			Non-Greenlanders			Total		
	Men	Women	Total	Men	Women	Total	Men	Women	Total
0-4	2280	2189	4469	210	199	409	2490	2388	4878
5-9	1732	1612	3344	332	323	655	2064	1935	3999
10-14	1970	1833	3803	308	265	573	2278	2098	4376
15-49	13198	12564	4959	1861	6820	6820	18157	14227	32384
50-59	1553	1642	3195	494	103	597	2047	1745	3792
60-64	431	486	917	88	15	103	519	501	1020
65+	747	1091	1838	46	14	60	793	1105	1898
Total	21911	21219	43130	6437	2780	9217	28348	23999	52347

TABLE 5. Greenland's population by nationality and municipality, 1984

Municipalities		Greenlanders	Non-Greenlanders	Total
Danish name	Greenlandic name			
Nanortalik	Nanortalik	2565	286	2851
Julianehåb	Qaqortoq	2698	519	3217
Narssaq	Narsaq	1797	347	2144
Ivigut	Ivittuut	6	40	46
Frederikshåb	Paamiut	2502	332	2834
Godthåb	Nuuk	7253	3215	10468
Sukkertoppen	Maniitsoq	3576	550	4126
Holsteinsborg	Sisimiut	3871	763	4634
Kangaatsiaq	Kangaatsiaq	1236	63	1299
Egedesminde	Aasiaat	3073	431	3504
Christianshåb	Qasigiannuit	1684	177	1861
Jakobshavn	Ilulissat	3793	491	4284
Godhavn	Qeqertarsuaq	944	89	1033
Umanak	Uummannaq	2287	259	2546
Upernavik	Upernavik	2062	124	2186
Thule	Qaanaaq	730	57	787
Angmagssalik	Tasiilaq	2524	252	2776
Scoresbysund	Ittoqqortoormiit	454	56	510
Outside the municipalities		75	1166	1241
Total		43130	9217	52347

with other places in Greenland, making overall economic development difficult. The use of capital stock is often inefficient (Fig. 3). The development of both infrastructure and air transportation (Fig. 4) requires heavy input of resources. As well, inhabited localities are at different stages of economic development, with life in some places little changed from the traditional past, whereas in others it is much like living in a Danish town.



FIG. 3. The large construction machines remain unused during most of the year. Great distances combined with necessarily high transportation expenditures create inevitable inefficiencies, further increasing building and construction costs.

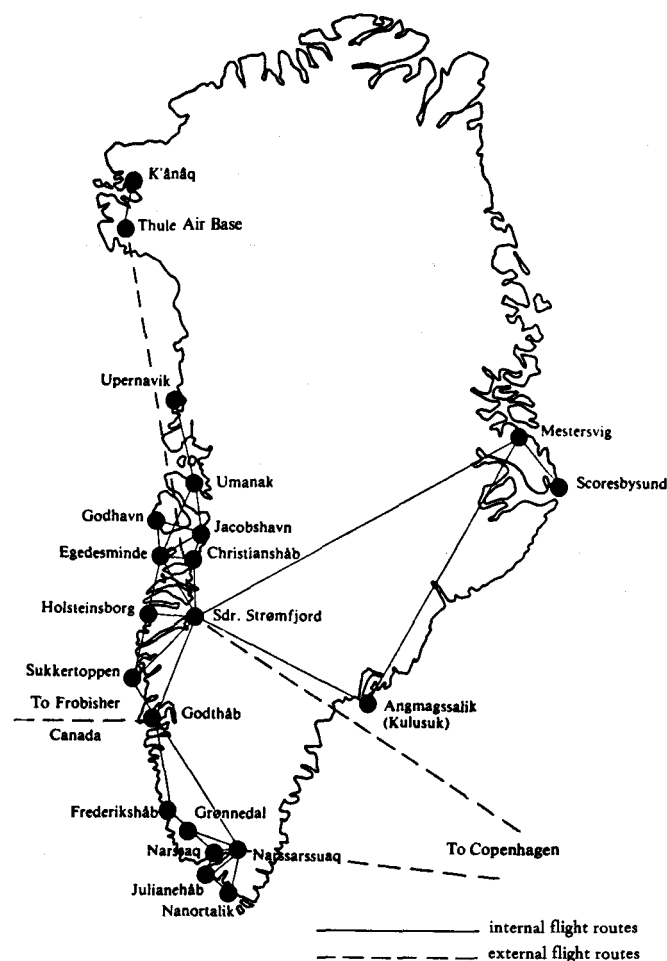


FIG. 4. Flight routes in Greenland.

Labour Force

As there is no exact enumeration of the present labour force, its size must be estimated. The population aged 15-60 years is

about 37 000. If the labour force participation rate is assumed at 65-70%, the labour force would be around 25 000. About two-thirds of the labour force is employed in the public sector and in public corporations. The industrial distribution of the labour force according to the population in 1976 is shown in Table 6.

At the beginning of the 1980s there was a marked increase in labour force size, caused by the entrance of young people born in the 1960s. This has resulted in growing unemployment among young Greenlanders. Some years ago the Home Rule Authorities decided that non-Greenlanders may be employed only if there is not local qualified labour available, but with the frequent scarcity or absence of relevantly trained Greenlanders, this law does little to solve the problem.

TABLE 6. The labour force by industry, October 1976

	Employed persons	% of total employed persons
Fishing	2419	11
Catching and sheep breeding	803	4
Mining and manufacturing	3205	15
Building and construction	3112	15
Trade	2153	10
Transport	1842	9
Other private services	1589	7
Public administration	5374	25
Other	881	4
Total	21378	100

Education

For more than 200 years Denmark's colonial rule promoted a policy of cultural isolation. Greenland was administered by Danes in Denmark and in Greenland, and the language of administration was Danish, while the language used by Greenlanders was mostly their own language. The Greenlandic language reflects the people's physical environment. On the other hand, it is only slightly developed for abstract thinking.

Compulsory schooling was introduced early in Denmark, in the beginning of the 19th century, and some time later basic schooling was also established in Greenland. Today the level of education in Greenland — but not the time invested — is modest. Relatively few young people get higher education, especially academic, because of both the lack of tradition and the absence of a direct program for higher education.

The nine-year compulsory schooling consists of a three-year introductory school and a six-year basic school. This form of primary school ends with an examination called FA. After a nine-year compulsory education, there is the possibility of two years' further schooling, called FU, and after that a two-year school (FUA) consisting of different training courses. FUA is the entrance exam for admission to either a two-year higher preparatory school (situated in Greenland in Nuuk/Godthåb and Aasiaat/Egedesminde as well as in Denmark) or a three-year high school/grammar school in Denmark. To gain admission to Danish universities, the student has to graduate from high school/grammar school in Denmark or pass the higher preparatory examination in Nuuk/Godthåb or Aasiaat/Egedesminde. Table 7 shows substantial growth in all areas.

Vocational training is being reshaped to suit the Greenlandic society. Vocational training accounts for about half of the

TABLE 7. Examinations passed by Greenlandic pupils, 1978-82

	1978	1979	1980	1981	1982
1) Primary school learning certificates for single subjects	2476	4447	4315	4128	4473
2) Higher preparatory examination	20	43	56	63	69
3) Upper secondary school examination (general certificate)	13	16	15	11	14

- 1) Number of subjects passed is about 8-10 times as large as the number of pupils who passed examinations. (The examinations consist of 8-10 subjects.)
 2) & 3) Number of examinations is identical with the number of pupils who passed examinations.

post-secondary graduates, as shown in Table 8. Teacher-training is the next most important, accounting for about one-third of the graduates. The remainder specialize in technical and navigational studies. University graduates account for less than 1% of the total.

Capital Stock

Capital stock consists of dwellings, infrastructure and production potential. In Greenland there are around 13 000 dwellings, which suggests a staggering shortage. As mentioned earlier, infrastructure development requires heavy investment. In the last few years the infrastructure has been increased significantly, with most of Greenland's EEC support being allocated for investment in infrastructure.

The business sector's production potential is in many ways not competitive. This applies, for instance, to fishing vessels: In 1983 there were 427 fishing vessels larger than 5 gross registered tonnes (GRT). Out of those, 82% were less than 25 GRT and only 7% were modern trawlers (Fig. 5). The nature of the fishing fleet means that most of the vessels can only be used for fishing near the coast and are incapable of utilizing most of the 200-nautical-mile fishing zone introduced in 1977.

The Public Sector

The public sector in Greenland is imposing. Around two-thirds of the approximately 25 000 persons in the labour force are employed in this sector, which performs activities in nearly all categories of market and non-market production in Greenland. The public sector also includes the Danish government, the Greenland Home Rule Authorities and the 18 municipal governments.

The Danish government undertakes economic activities in both Denmark and Greenland with respect to Greenland. The departments responsible include the Danish ministries, the



FIG. 5. Modern fishing in Greenland — fishing vessels in Jakobshavn (Ilulissat), and a modern fish fillet factory in background.

Royal Greenland Trade Department (up to 1 January 1986, now Kalaallit Niuerfiat, KNI/Greenland Trade Department) and the Greenland Technical Organization (a directorate under the Ministry for Greenland until 1 January 1987).

In 1981 the Danish government's net expenditure on working expenses, construction costs and loans applicable to Greenland was Dk 2058 million. Of this, Dk 240 million originated from the Royal Greenland Trade Department and Dk 45 million from the Technical Organization in Greenland. Furthermore, Dk 504 million were included in block grants to the Greenland Home Rule Authorities and Dk 152 million were contributions to the municipalities.

In 1981, the Greenland Home Rule Authorities spent Dk 829 million, Dk 384 million being contributions to the municipalities. The revenues amounted to Dk 892 million, of which Dk 356 million were direct revenues and the rest current transfers from the Danish government and the EEC. The direct revenues comprised income taxes (Dk 107 million), import duties on sugar, beer and other alcoholic beverages (Dk 159 million), motor vehicles tax (Dk 10 million) and interest and other revenues (Dk 80 million).

The expenditures by the municipalities in 1981 amounted to Dk 762 million. The revenues were Dk 769 million, of which Dk 326 million were direct revenues and the rest current transfers. The most important source of revenue was income tax, amounting to Dk 276 million.

Public investment in Greenland in 1981, mainly financed by the Danish government as investment in infrastructure, amounted to Dk 815 million.

TABLE 8. Greenlanders having completed post-secondary training in Greenland, 1977-82

	1977	1978	1979	1980	1981	1982
University education and corresponding level	2	3	1	2	—	—
Primary school teachers	42	42	29	46	28	43
Social, pedagogical and public health courses	43	69	68	86	64	97
Further technical training courses	33	9	10	8	29	23
Training in navigation	42	30	26	32	34	39
Apprentices and basic vocational training	215	198	192	198	211	206
Other training	45	52	30	28	22	12
Total	422	403	356	400	388	420
Women	177	188	160	169	154	200

TABLE 9. Number of private enterprises in Greenland in 1979 by industry and type of organization

Industry	Type of organization				Total
	Sole proprietorship		Partnerships	Corporate enterprises	
	Without employees	With employees			
Fishing, hunting and sheep breeding	1547	319	31	24	1921
Mining and manufacturing	4	10	2	33	49
Building and construction	12	178	15	55	260
Trade	21	64	3	63	151
Hotels and restaurants	5	35	2	18	60
Transport	120	82	1	12	215
Other services	17	50	8	122	197
Total	1726	738	62	327	2853

TABLE 10. Production account for private enterprises in Greenland, 1979, in millions of Dk

	Fishing, hunting and sheep breeding	Mining and manufacturing	Building and construction	Trade	Hotels and restaurants	Transport	Other services	Total
1. Output of goods and services	335.3	661.2	574.9	167.8 ¹	134.1	100.4	120.9	2094.6
2. Intermediate consumption	103.5	334.2	315.1	48.6	80.8	57.9	40.4	980.5
3. (= 1-2) Gross value added at market prices	231.8	327.0	259.8	119.2	53.3	42.5	80.5	1114.1
4. Compensation of employees	87.1	100.6	173.0	64.0	32.9	18.1	36.2	511.9
5. (= 3-4) Gross operating surplus	114.7	226.4	86.8	55.2	20.4	24.4	44.3	602.2
6. Compensation of employees in percent of value added	37.6	30.8	66.6	53.7	61.7	42.6	45.0	45.9
7. Value added per industry in percent of total value added	20.8	29.4	23.3	10.7	4.8	3.8	7.2	100.0

¹Output of goods and services in trade is defined as turnover minus purchases of goods for resale.

Private Sector

The private sector comprises around 14 000 households and 2850 enterprises. Table 9 shows the number of private enterprises in Greenland in 1979 by industry and type of organization. Table 10 shows value added in corporate enterprises, partnerships and sole proprietorships in the private sector and the distribution by compensation of employees and by gross operating surplus in different industries. Total value added in 1979 in the private sector enterprises was Dk 1114 million, of which Dk 512 million was for employee compensation.

In fishing, hunting and sheep breeding 92% of value added came from fishing. There were 383 fishing vessels, of which only 21 were big, modern trawlers; 38% of value added came from these.

Mining and manufacturing are dominated by the activities of Greenex, a Danish corporation that is part of the multinational Canadian enterprise Cominco. Its lead, zinc and silver mine in Marmorilik is the only producing mine in Greenland. The value added by Greenex in 1980 was a little greater than the total value added in fishing and sheep breeding in the private sector. In the mid-'80s falling zinc prices caused trouble for mining.

A search for oil in western Greenland began in the late '70s, but after a few negative trial drillings the work was abandoned. In January 1985 a 12-year concession for oil exploration in Jameson Land, East Greenland, was given to a consortium, A/S Arco Greenland, owned by Atlantic Richfield Company, Arctic Minekompagni A/S, København, and a public corporation owned half by the Danish state and half by the Greenland Home Rule Authorities. After 350 km seismic profiles the activity was suspended in spring 1986 due to the fall in oil prices.

Uranium production could probably be profitable, but exploi-

tation is politically unacceptable in Greenland. Several deposits of other minerals are also known, but exploitation is considered unprofitable for the time being.

Foreign Trade

Greenland's foreign trade is comprehensive in relation to its population size. The exports are concentrated in a narrow range of commodities, while imports include nearly all categories of goods. Fish and fish product exports have, despite difficulties with ice, developed favourably, mostly as a consequence of high prices for fish products.

Its deficit in foreign trade means that Greenland must have capital from the outside world in order to maintain existing living standards (Table 11).

TABLE 11. Greenland's foreign trade, 1979-82, in millions of Dk

	1979	1980	1981	1982
Exports				
Total	789	1046	1325	1436
Fish and fish products	431	623	789	860
Mineral ore	299	363	399	394
Imports				
Total	1448	1848	2096	2311
Foodstuffs	197	226	252	269
Drink	85	89	99	159
Oil and oil products	266	372	412	486
Vehicles	32	45	45	56
Vessels (boats, etc.)	68	135	129	83
Deficit	659	802	771	875

Consumption and Investment

Exact information on consumption in Greenland does not exist, but for 1979 the consumption of goods can be estimated to be about Dk 2000 million on the basis of accounting information from the Royal Greenland Trade Department. In 1977-78 a special survey in consumption expenditures by wage earners was undertaken. This survey found that two-thirds of goods consumed were imported.

Information on investment is available only for the public sector. In 1982 public investment in Greenland amounted to Dk 863 million, of which Dk 838 million was invested in the municipalities. An overwhelming part of this investment was in infrastructure and dwellings (Fig. 6).



FIG. 6. Old and new buildings in Godthåb/Nuuk: the colonial buildings are seen in the foreground and new dwellings dominate the hill behind.

Income

On 1 January 1975 a personal income tax was introduced in Greenland. Data from this tax system has been used to create a statistical description of the income situation. Since in Greenland there is joint taxation of married couples, a single income assessment is for either a married couple or a single person older than 15 years. The average taxable income per assessment in the years 1979, 1980 and 1981 amounted respectively to Dk 53 000, 62 000 and 72 000, suggesting increases in income of 16-17% annually. The income data were analyzed for 1977-79, and the Dk 53 000 in 1979 was broken down by type of assessment, as shown in Table 12.

Geographically there is an immense difference in the average taxable income per assessment. The average level of Dk 53 000 in 1979 includes the average from the towns (Dk 57 000), the settlements (Dk 27 600) and the stations (Dk 74 100).

TABLE 12. Average taxable income per assessment by nationality and type of assessment, 1979, in Dk

	Single persons		Married couples	Total taxable units
	Men	Women		
Greenlanders	32 100	19 000	81 800	37 400
Non-Greenlanders	88 300	39 400	178 400	101 500
Total	49 200	21 800	108 800	53 000

Although most is known about taxable income, other types of income also play an important role in personal income. Income-in-kind is an important factor in Greenland, especially in the settlements and outlying municipalities. It is noteworthy that the level for income-in-kind is higher than the level of tax-free transfers. Income-in-kind in 1979 is calculated to be Dk 1880 per person, about 4% of the total income per person.

Income inequality is common and causes tension between Greenlanders and Danes in Greenland. Emotion is further aroused by the so-called "birthplace criterion," which requires that persons born in Greenland be paid 15% less than those born outside for doing the same job.

NATURAL RESOURCES

Mineral Deposits

Cryolite: Prior to 1973 the principal mineral produced in Greenland was cryolite. During the last century cryolite production at Ivigtut was the major contribution to the economy in Greenland.

The manufacture of aluminum, which uses cryolite in the production process, was greatly increased during World War II. Export of cryolite to the U.S. and Canada during the war, while trade with Denmark was interrupted, ensured a favourable balance in the Greenlandic economy. Deposits of cryolite are now almost depleted, after having yielded some 3.5 million tonnes.

Lead and zinc: About 130 000 tonnes of concentrated ore were shipped from the lead mine at Mesters Vig in East Greenland between 1956 and 1962. Today the lead and zinc mine at Marmorilik, in the district of Umanak, is the only producing mine. In 1971 Greenex obtained a concession to explore and exploit a 200 km² area until 1996. The mine produces about 650 000 tonnes of ore per year, with a yield of about 140 000 tonnes of zinc concentrate, approximately 40 000 tonnes of lead concentrate and approximately 35 grams of silver per tonne of ore. The mine employs 320 people, 150 of them Greenlanders. The fall in zinc prices and uncertainty regarding the size of the deposits present a threat to continued mining.

Iron: There are iron ore deposits at the head of the fjord complex at Isukasia, at the edge of the ice cap 150 km northeast of Godthåb/Nuuk. The content of this ore, however, is just over 30%, which is low. On the other hand, some 550 million metric tonnes have been traced, and the expectation is for nearly two billion. These huge deposits of iron have no commercial value for the near future due to present iron prices and to the need for capital investment for construction of the mine, a hydroelectric power station, transport facilities (including a harbour) and a local community for the workers and their families.

Chromium: Chromium has been found at Fiskensæset, in southwest Greenland. The deposits are sparse and the chemical composition of the ore is poor by world standards, but it is apparently the largest find in any NATO member state. At the present price level, the Greenlandic deposits are not worth large-scale production.

Molybdenum: Slightly south of Mesters Vig, at Malmbjerget, large deposits of molybdenum have been found. The metal content is not impressive — about 0.25% — and Malmbjerget lies between two glaciers, making mining difficult.

Tungsten: The price of tungsten presents possibilities for some small-scale production from local deposits of scheelite at

remote areas in East Greenland, especially if an infrastructure is established for other purposes.

Anorthosite: Just north of Søndre Strømfjord, near Qaqortorsuaq, a great deposit of anorthosite — a hard silicate rock with a content of 25-30% aluminum oxide — has been found. Most current production of aluminum is based upon bauxite, of which 70% of known reserves is located in very few countries (among them Australia, Guinea and Brazil). This anorthosite could form the basis for a Greenlandic aluminum industry, combining the aluminum oxide-rich anorthosite, local hydroelectric potential and a good shipping location near the open sea.

Energy Resources

Coal: In 1924-72, 600 000 tonnes of coal were mined at Qutdligssat, on the island of Disko. The mining settlement was closed down in 1972, because the production had been unprofitable for several years. However, the rise in energy prices altered the picture, and today the situation is being reevaluated, with support from the EEC, looking at possible resumption of coal mining, primarily on the Nugssuaq peninsula in West Greenland. Deposits there are estimated to be about 100 million tonnes. Using traditional mining technology, only 20 million tonnes can be mined. An area of about 325 km² is being mapped geologically with the intention of having the size and the quality of the deposits proven.

Uranium: The uranium deposits of Narssaq is the only one that has been investigated for possible exploitation. Prospecting for uranium has been carried out in various other places in Greenland, in part financed by the EEC; several deposits have been found, but their extent has not yet been mapped.

The Narssaq deposit has been confirmed at 27 000 tonnes plus a reserve of some 16 000 tonnes. Production costs are expected to be fairly high, since the uranium content is relatively low (300 grams of uranium per tonne of ore) and because the uranium is chemically linked to the minerals in the ore in a way making extraction difficult. In addition to economic considerations, political and environmental conditions play a considerable role, and so does the attitude toward introduction of nuclear power in Denmark. The Home Rule Authorities in Greenland are against uranium mining.

Oil and natural gas: The continental shelf of West Greenland was subject to an oil survey in the late '70s, during which time five drillings showing negative results were carried out in the area between 63° and 68°N. Present information about this and other areas on the continental shelf does not encourage further exploration. In North Greenland a sedimentary basin stretches from Pearyland in the east via Inglefield Land to the Canadian archipelago, including Ellesmere Island, Sverdrup Basin and Melville Island in the west. The expectation of finding oil and natural gas in this area is relatively high. Jameson Land and other areas in northeast Greenland still present the most interesting oil and gas potential in Greenland.

Hydroelectric power: For many years it has been recognized that hydroelectric power stations in Greenland are a possibility. As there is no local demand for large amounts of such energy in Greenland, there was no incentive to invest in hydroelectric power. Since the energy crisis in 1973, however, interest in making use of the arctic hydro reserves has increased.

In recent years comprehensive glacier-hydrological, geological and meteorological investigations have taken place under Danish government management in order to map the technical

and physical possibilities of setting up hydroelectric plants. Particular interest centers upon the extensive basin areas away from settlements that can be reached by sea, where the power stations might, for example, provide energy for use in mining and production of fertilizers or aluminum and around basins close to settlements and towns needing power.

Living Sea Resources

The cold and warm ocean currents have a decisive influence on living sea resources. The polar current from the Arctic Ocean flows along the East Greenland coast. From Denmark Strait this water joins the Irminger current, a branch of the North Atlantic Drift, and becomes the West Greenland current. The meeting of the cold and warm currents causes turbulence, making the waters rich in nutritive salts, including phosphate and nitrate. With solar radiation these foster primary production of plankton, supporting living resources, both marine mammals and fish, in the sea around Greenland. The latter are of greater significance to the Greenlandic economy.

Fish: Commercial fishing began after World War I and was favoured by a relatively mild climate from 1925-65. Around 1960 it was decided to develop fishing, but the colder climate from the mid-sixties upset these plans. However, the 200-mile economic zone, introduced in Greenland in 1977, made it possible to continue the development of the fishing industry and to enlarge the Greenlandic catch (Fig. 7). Of primary importance are cod, shrimp and the North Atlantic salmon species, but wolffish, Greenland halibut, halibut and redfish are also important.

Marine mammals: Among the marine mammals, the catch of seals is of special importance. About 80 000-90 000, mostly ringed seals, are caught annually.

Six hundred families — 5% of the population of Greenland — base their economy on catching and trapping, and for many other families these activities provide an important income supplement. The income-in-kind of seal meat is about 2600 tonnes annually. Besides seals, walrus (330-400 per year) and non-endangered species of whales are taken annually for local use. The catch is entirely of a subsistence nature.

CONCLUSION

Since World War II Greenland's development has accelerated, totally changing its social structure. The Danish government put an end to the colonial status of Greenland and set in motion a strategy for involving enormous investment, mostly in infrastructure and social welfare. At the same time Greenlanders have become politically conscious and have attained a higher degree of political independence, resulting in the present Home Rule Law.

Greenland has developed a local national economy characterized by dependence on capital inflow from the outside world, mainly Denmark, and with an enormous public sector. Infrastructure investments are comprehensive, but those in production are too small. Greenland's economy requires an educated labour force. Since Greenlanders currently lack higher education, the 20% of the population consisting of educated non-Greenlanders will have to remain in Greenland in coming years.

If the Greenlandic economy is to continue its growth, increased capital inflow, higher educational levels and greater investments in production will have to be realized. One possibil-

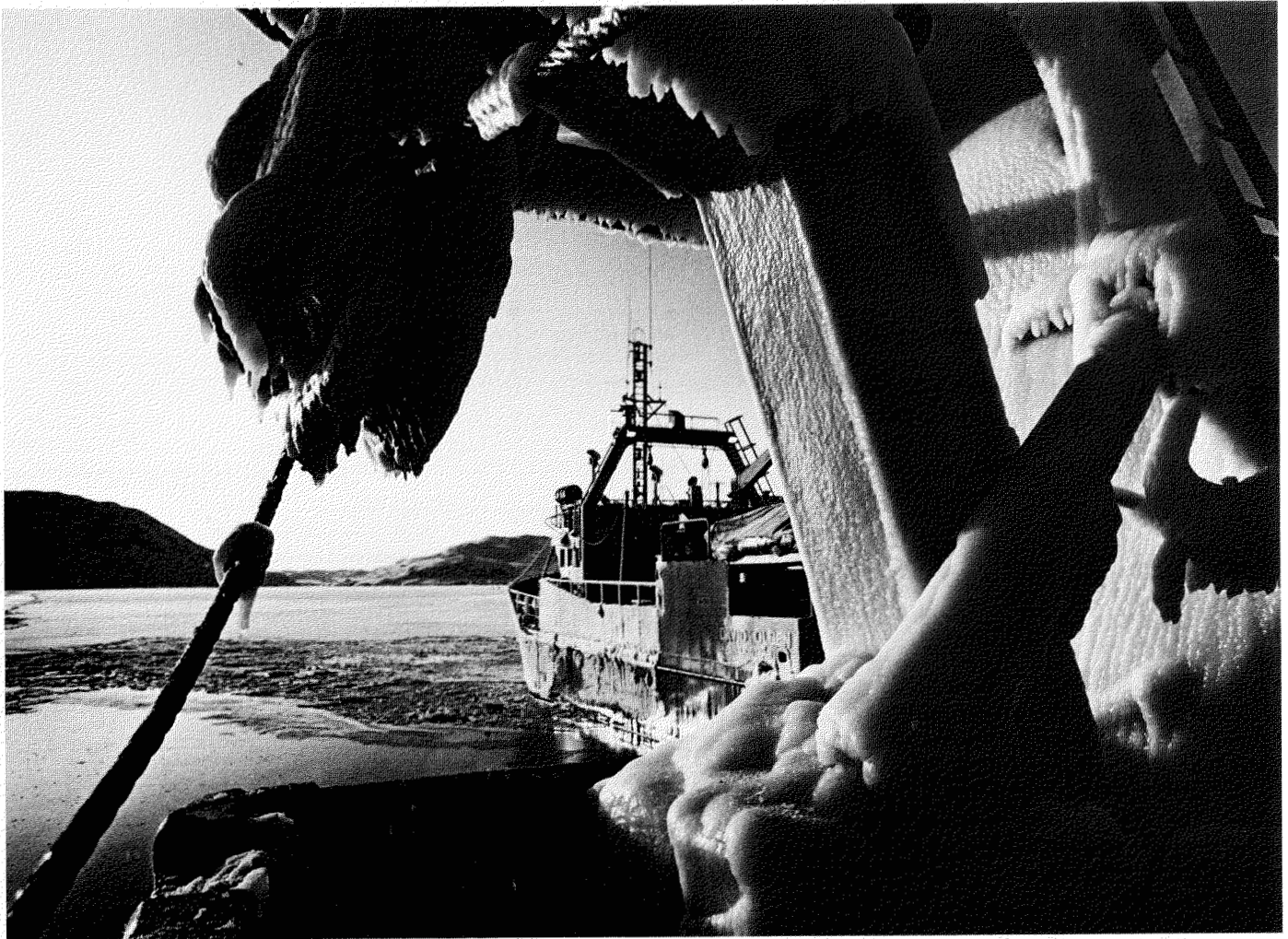


FIG. 7. One of about 30 trawlers suitable for harsh arctic operations.

ity is for the needed capital inflow to occur in connection with exploitation of mineral deposits and energy reserves, which simultaneously will create the basis for more Greenlandic autonomy. There could be exploitation of hydroelectric power potential, deposits of iron, chromium, molybdenum, tungsten, uranium and perhaps oil, but not for the time being. However, to make such exploitation feasible, the deposits must be both adequately large and rich. Such economic development also demands still more workers and specialists from abroad with relevant training. Many changes in the Greenlandic society would result. Another possibility might be based upon enlarged industry and fishing and favourable fishing agreements. Such growth based on fishing is, however, very dependent on climatic conditions.

The most probable outlook is that capital inflow from Denmark will continue at current levels with investment shifting more toward production and away from infrastructure.

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