Interne notater

STATISTISK SENTRALBYRÅ

CENTRAL BUREAU OF STATISTICS

83/14

8 June 1983

NATURAL RESOURCES 1982

CONTENTS

This publication is largely a summary in English of a report presenting key figures on Norwegian natural resources in 1982 ("Naturressurser 1982". Report 83/1 from the Central Bureau of Statistics). The resource accounting system developed by the Norwegian Central Bureau of Statistics constitutes the framework for the statistics. Editor has been Mr. Hans Viggo Sæbø.

1. INTRODUCTION

At the beginning of each year, the Norwegian Central Bureau of Statistics presents preliminary figures from its natural resource accounts. The first complete accounts on energy, some minerals, forest, fish and land were published in 1981[1)].

The current report provides some key figures on Norwegian natural resources and their exploitation, referring to 1982. The report is largely an English Summary of a report published early in 1983[2)].

Most figures which are being presented are preliminary, and may be revised later. The report contains information on extraction, supply and use of energy, important minerals, forest and forest products. Furthermore, preliminary figures on stock development for North-East Arctic cod and haddock, and catch figures for the most important fish species, are presented. As for land use, some results from a project aimed at describing land use patterns in urban settlements are illustrated by coloured maps.

Some results from an analysis projecting energy consumption to 1990 are included in the paragraph on energy.

The work on resource accounts provides some figures reflecting the environmental effects of resource exploitation as well. Hence, this report contains figures concerning emissions to the air resulting from energy consumption. In addition, selected results from a project on environmental impacts of hydro power development are presented. Figure 1 illustrates the most important issues and figures which are considered in the report.

---

1) "Resource Accounts". Statistical Analysis 46, Central Bureau of Statistics, Oslo 1981.

2) "Naturressurser 1982". Report 83/1, Central Bureau of Statistics, Oslo 1983.

Figure 1. Figures from the resource accounts

Stage in the accounts \ Resource category	Energy	Mineral	Forest	Fish	Land
RESERVES	Potential hydro power. 1 January 1983 Petroleum resources 1 January 1983	Known and economic reserves for selected minerals 1 January 1982 Reserve accounts for minerals 1980-1982.	Stock size in 1981	Stocks of North-East Arctic cod and haddock	Map showing undeveloped land within residential areas in the Fredrikstad/ Sarpsborg urban settlement
EXTRACTION	Extraction of energy 1930-1982	Extraction and supply of selected minerals 1980-1982.	Logging 1980-1982.	Quota and catch for selected stocks 1970-1982. Catch by species 1979-1982.	
USE	Electricity balance 1973-1982. Net use of energy 1976-1982. Energy use and gross domestic product Prices of electricity and selected oil products.		Roundwood supply 1980-1982. Production and supply of wood and wood products 1980-1982. Production of chemical pulp 1960-1982.	Exports of fish commodities 1977-1982.	Maps showing land use and land use changes in Fredrikstad/ Sarpsborg 1955-1975.
ANALYSIS	The demand for electricity and fuel 1980, 1985 and 1990.				
EFFECTS ON THE ENVIRONMENT	Emissions of SO_2, NO_x and CO to air Hydro power development. Technical enroachments and effects on fish.		Emmission from wood processing industries to water.		

2. ENERGY

By 1 January 1983 the developed hydro power potential in Norway was 97,0 TWh (mean annual production). This is 2,3 TWh more than at the beginning of previous year (figure 2).

The status of the remaining undeveloped Norwegian hydro power is shown in table 1. A National Master Plan comprising most of this potential will be worked out during the next years.

Table 2 and 3 provide accounts for the Norwegian petroleum reserves which, so far, are decided to the extracted. These reserves have been divided into cost groups. The actual price at 1 January 1983 was 32 $ per barrel, corresponding to the economically recoverable reserves given in table 2 and 3. A lower price causes an earlier cutting of the production and hence a lower reserve estimate as shown in table 4.

Table 1. Potential hydro power status 1 January 1983. TWh mean annual production potential.

	Total	Included in National master Plan for hydro power development	Protected up to 1985	Excluded from National master Plan for hydro power development
Total	63.3	32.7	12.6	18.0
Consession given	7.5	-	-	7.5
Consession applied for	16.6	7.3	-	9.3
Announcement given	6.2	5.8	-	0.4
Protected up to 1985	12.6	-	12.6[1)]	-
Remainder	20.4	19.6	-	0.8

1) This hydro power is under evalution. Some of it will be permanently protected. The rest will be included in National Master Plan for hydro power development.

Table 2. Reserve accounts for crude oil 1975 - 1982. Mill. tons.

	1975	1976	1977	1978	1979	1980	1981	1982
Reserves 1/1	657	703	609	589	570	520	496	509
New fields	-	60	-	-	-	24	80	-
Revaluation	55	-140	-6	-2	-31	-24	-43	43
Extraction	-9	-14	-14	-17	-19	-24	-24	-25
Reserves 31/12	703	609	589	570	520	496	509	528

Figure 2. Potential hydro power. 1 January 1983. Preliminary figures. TWh

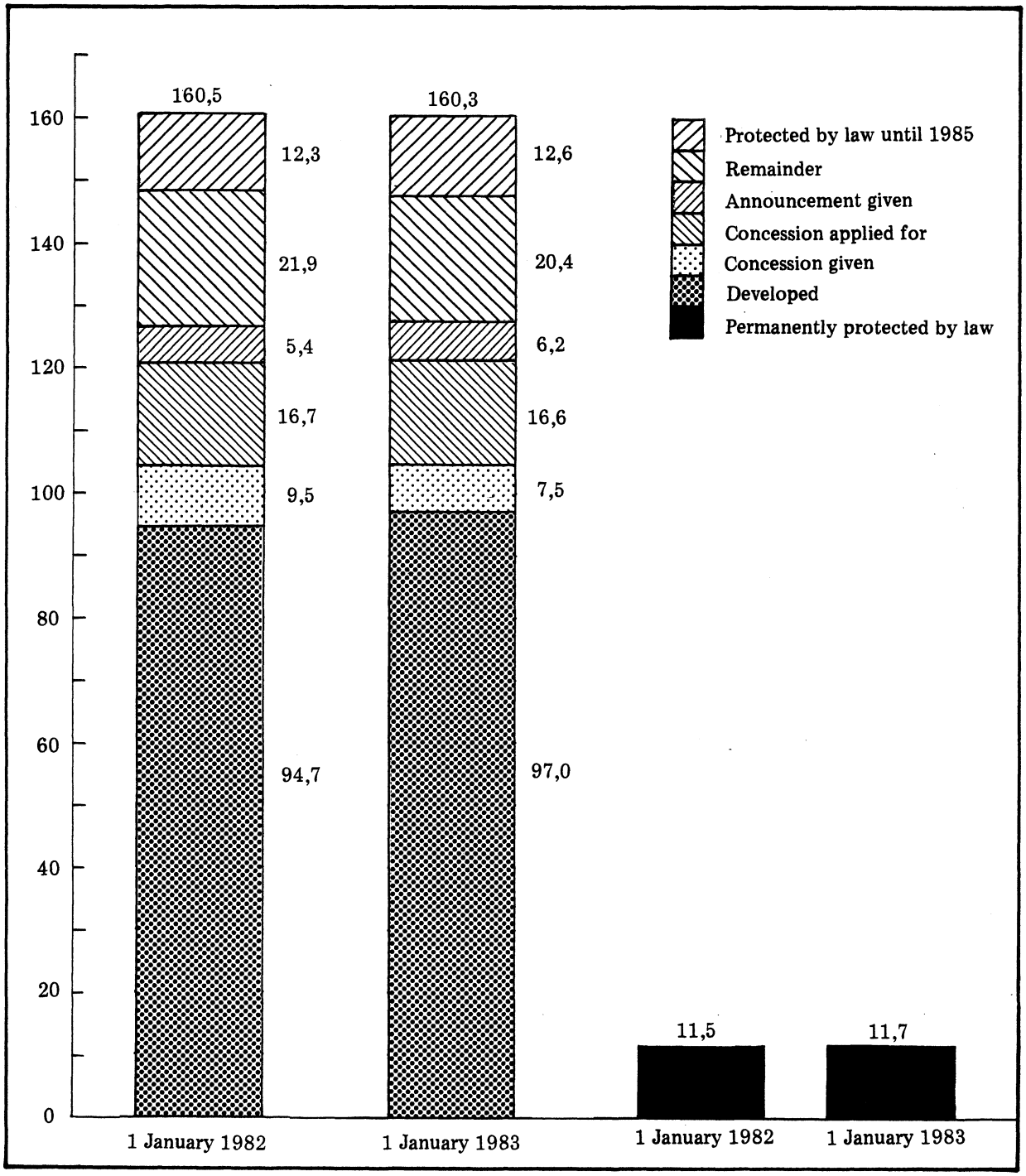


Table 3. Reserve accounts for natural gas 1975 - 1982. Bill. Sm^3.

	1975	1976	1977	1978	1979	1980	1981	1982
Reserves 1/1	589	540	497	498	445	406	385	381
New fields	-	42	-	-	-	32	40	-
Revaluation	-49	-85	4	-39	-17	-27	-18	4
Extraction	-	-	-3	-14	-22	-26	-26	-25
Reserves 31/12	540	497	498	445	406	385	381	360

Table 4. Petroleum reserves divided into cost groups according to different oil and gas prices[1].

Price per bbl.	Crude oil	Natural gas
	Mill. tons	Bill Sm^3
$ 32	500	358
$ 25	487	348
$ 20	467	306
$ 15	346	277
$ 10	323	228

1) The Ula field is not included.

The Norwegian production of crude oil and natural gas corresponded to approximately 49,5 mill. tons oil equivalents in 1982 compared to 49,7 mill. tons in 1981. Export income from this production constituted about 53 000 mill. N.kr. in 1982.

The Norwegian energy consumption decreased approximately 1,5 per cent from 1981 to 1982. This is due to low activity rates in several industries, substitution of oil by hydro power and a mild climate in 1982 compared to 1981. With the exception of the energy intensive manufacturing, the consumption of electricity increased by about 5 per cent when taking into account temperature deviations between the two years.

Energy consumption has been projected up to the year 1990. The total demand for electricity is estimated to be 101 TWh in 1990, of which other sectors than the energy intensive manufacturing are assumed to consume 69 TWh. The effects of alternative assumptions of production, prices and house construction have been analysed as well. By assuming similar levels of production in the manufacturing industries in 1990 as in 1983, electricity consumption in 1990 will be more than 6 TWh less than estimated.

Table 5. Extraction of energy commodities in Norway. 1930 - 1982.

	Coal	Crude oil	Natural gas	Hydro power
	Mill.t	Mill.t	$10^9 Sm^3$	TWh
1930	0.2	-	-	8.7
1939	0.3	-	-	10.9
1950	0.4	-	-	16.9
1960	0.4	-	-	30.9
1970	0.5	-	-	57.3
1971	0.5	0.3	-	63.3
1972	0.5	1.6	-	67.4
1973	0.4	1.6	-	72.8
1974	0.5	1.7	-	76.6
1975	0.4	9.2	-	77.4
1976	0.5	13.8	0.3	82.0
1977	0.4	13.6	3.1	72.2
1978	0.4	17.0	14.9	80.9
1979	0.3	18.8	21.6	89.0
1980	0.3	24.4	26.0	84.0
1981*	0.4	23.6	26.1	93.0
1982*	0.4	24.0	25.5	92.7

Table 6. Electricity balance 1973 - 1982. TWh

	1973	1974	1975	1976	1977	1978	1979	1980	1981*	1982*
Production	73.0	76.7	77.5	82.1	72.4	81.0	89.1	84.1	93.1	92.8
Imports	0.1	0.1	0.1	0.2	2.7	0.8	0.8	1.8	1.9	0.6
Exports	-5.3	-5.6	-5.7	-6.9	-1.6	-4.2	-5.5	-2.3	-7.1	-6.6
Gross supply	67.8	71.2	71.9	75.5	73.5	77.6	84.5	83.6	87.9	86.8
Losses in transmission lines, statistical errors	-6.8	-6.8	-7.1	-8.0	-7.4	-8.0	-8.5	-8.0	-9.3	-9.3
Net consumption	61.0	64.4	64.8	67.5	66.1	69.5	76.0	75.6	78.6	77.5
Pumping power	0	0.1	0.1	0.1	0.3	0.2	0.4	0.5	0.5	0.5
Occasional power to electric boilers	2.2	3.0	3.2	2.5	0.6	1.2	1.5	1.2	2.4	2.2
Total firm power	58.8	61.3	61.4	64.8	65.2	68.1	74.1	73.9	75.7	74.8
Energy intensive manufacturing	26.6	27.4	26.2	26.5	24.7	26.1	28.8	27.9	27.4	25.6
Other consumption	32.2	33.8	35.2	38.3	40.5	42.0	45,2	46.0	48.3	49.2
Other consumption, corrected for deviations from normal temperature	32.1	35.0	26.2	37.8	40.0	41.2	43.6	45.3	47.0	49.5
Annual change. Per cent		9.0	3.5	4.5	6.0	3.0	6.0	4.0	4.5	5.0

Table 7. Net energy consumption[1]. 1976 - 1982. PJ

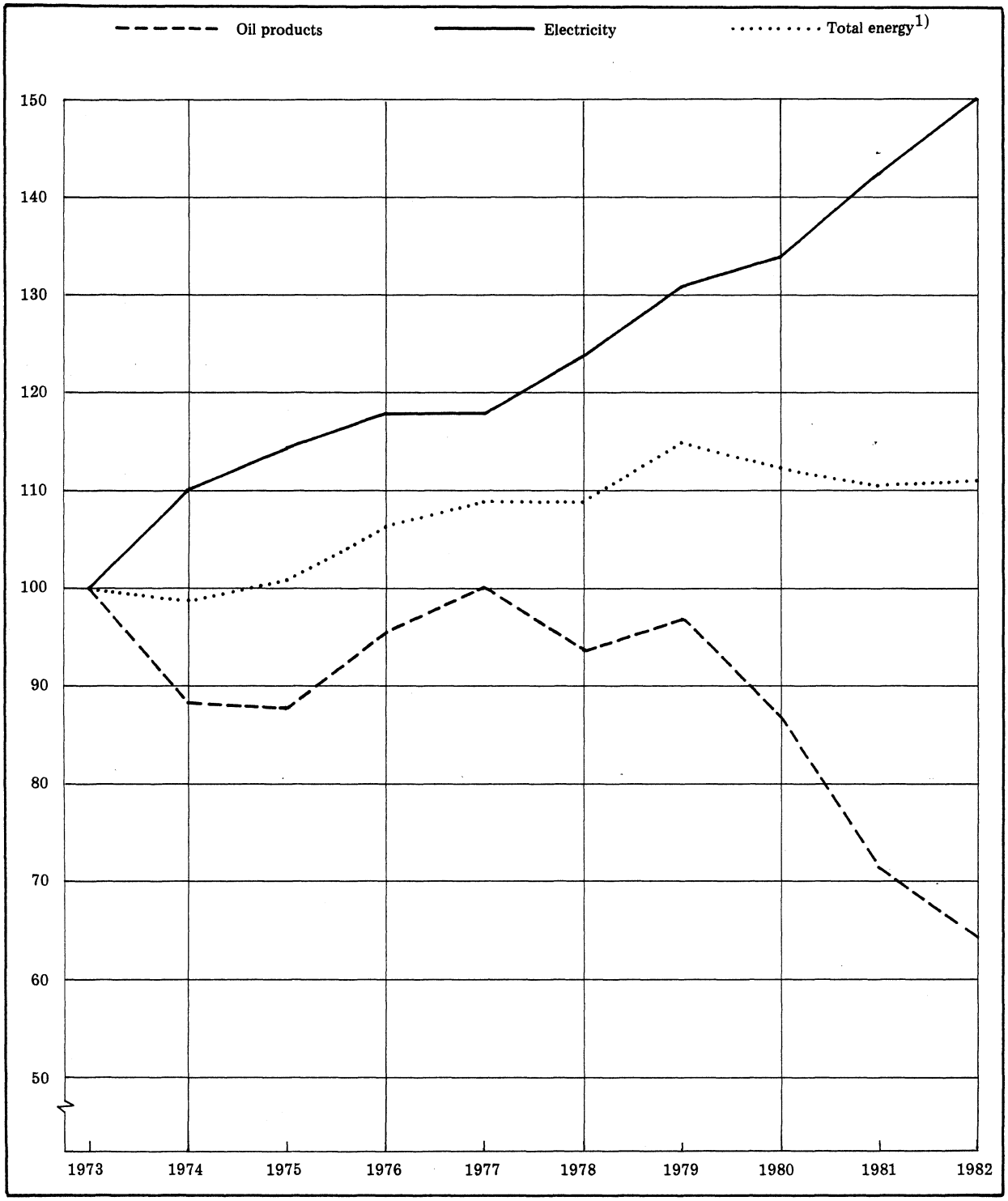
	1976	1977	1978	1979	1980	1981*	1982*
Total	938	955	947	985	981	946	..
Ocean transport	321	333	297	287	294	276	..
Domestic use	617	622	650	698	687	670	659
Of which							
Feedstocks[2]	60	55	72	84	88	85	84
Transport	153	163	167	174	166	164	168
Other purposes	404	404	411	440	433	421	407
Electricity	240	234	246	269	267	278	274
Oil	143	148	143	145	136	109	96
Solid fuels	21	22	23	27	30	33	37

1) Use of energy outside the energy sectors. 2) Includes coal and coke used in energy intensive manufacturing, oil products used in petrochemical manufacturing and oil products used as feedstocks in production of ammonia.

Table 8. Domestic use of energy and gross domestic product 1976 - 1982.

Year	Domestic use of energy			Gross domestic product except for crude oil and natural gas production
	Total	Feedstocks	Other	
		PJ		Mill. 1975-kroner
1976	617	60	557	153.000
1977	622	55	567	158.000
1978	650	72	578	161.000
1979	698	84	614	168.000
1980	687	88	599	171.000
1981*	670	85	585	173.000
1982*	659	84	575	172.000
Annual change. Per cent	1.1	5.8	0.5	2.0

Figure 3. Electricity consumption except energy intensive manufacturing. Oil for heating purposes. Temperature corrected index 1973-1982



1) Includes electricity except energy intensive manufacturing, oil and solid fuels for heating purposes.

Table 9. Prices of electricity for households and prices of some oil products[1]. Øre/KWh. All taxes included

	Thermal efficiencies	1977	1978	1979	1980	1981	1982	4/1-83
Electricity	1.00	11.7	14.2	16.0	17.3	20.5*	24.0*	28.0*
Petroleum	0.75	15.0	15.7	18.0	25.1	34.6	40.5	44.3
Fuel oil no. 1	0.70	12.7	13.3	15.8	25.6	32.7	35.9	39.4
Fuel oil no. 2	0.80	10.5	11.1	13.1	19.3	27.1	29.9	32.9

1) Utilized energy.

Table 10. Assumptions for simultation. Average annual change in per cent. Number of new dwelling units

	1980 - 1985	1985 - 1990
Real price of electricity	2.5	0.0
Real price of oil products	2.5	0.0
Change in gross value of production:		
Manufacturing and mining except energy intensive manufacturing	1.2	1.8
Energy intensive manufacturing	0.9	1.4
Trade and services	2.6	2.5
Annual new dwelling units[1]	34 500	30 600

1) Number of dwelling units decreases from 35 000 in 1983 to 30 000 in 1988. Later 30 000 per year. This corresponds to an average change in net space floor of 2.3 per cent a year from 1980 - 1985 and 1.9 per cent from 1985 - 1990. The average change from 1970 - 1980 was 2.9 per cent a year.

Table 11. Demand for firm power. 1980, 1985 and 1990. TWh

	1980	1985	1990
Firm power included losses	81.2	92.1	101.1
Energy intensive manufacturing included losses ..	28.8	29.8	32.0
Other consumption including losses	52.4	62.3	69.1
Other consumption excluding losses	45.2	53.7	59.6
Of which:			
Manufacturing and mining except energy intensive manufacturing	11.2	12.7	14.1
Other industries	12.1	14.6	16.4
Private households	21.9	26.4	29.1

1) Agriculture, construction, transport, trade and services.

Table 12. Demand for fuel[1]. 1980, 1985 and 1990. TWh energy content

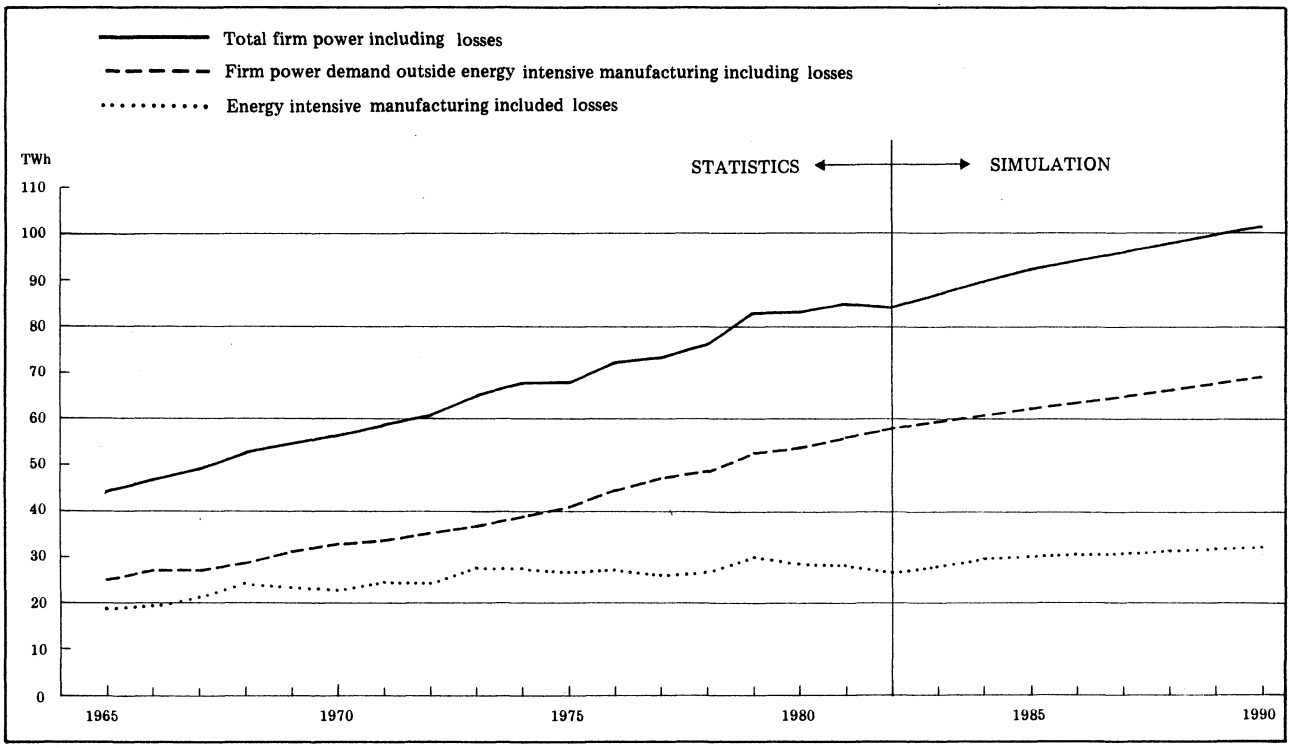
	1980	1985	1990
Total[2]	55.0	51.7	55.5
Energy intensive manufacturing	15.7	15.3	16.3
Other consumption	39.3	36.4	39.2
Of which:			
Manufacturing and mining except energy intensive manufacturing	17.4	16.9	17.3
Trade and services	7.5	6.3	7.2
Private households	14.4	13.2	14.7

1) Manufacturing and mining: Oil for all purposes. Trade and services: Oil for heating purposes Private households: Oil and solid fuels for heating purposes. 2) Agriculture, fishing, construction and transport are not included.

Table 13. The effects on the projected energy demand of changed assumptions

	Change in electricity demand in 1990 compared to table 11	Change in fuel demand in 1990 compared to table 12
10 per cent higher prices of oil products in 1990 than assumed	+ 1.4 TWh	- 2.1 TWh
The same production level in energy intensive manufacturing in 1990 as in 1983	- 4.2 TWh	- 0.8 TWh
The same production level in other manufacturing than energy intensive manufacturing in 1990 as in 1983	- 1.6 TWh	- 1.9 TWh
35 000 new dwelling units each year from 1980 to 1990	+ 0.5 TWh	+ 0.2 TWh

Figure 4. Demand for firm power included losses. 1965-1990



3. EMISSION TO AIR OF SO_2, NO_X AND CO

The emmission of SO_2 has decreased during the last years, mainly due to reduction of oil consumption and improved pollution abatement techniques. This emission is large in energy intensive manufacturing and particularly in manufacture of pulp and paper products, due to consumption of heavy fuel oil and coal/coke containing high concentration of sulphur. The emission of SO_2 from combustion engines using gasoline is small. The emission of NO_X and CO, however, is dominated by mobile sources.

It should be realized that the emission figures do not give information on the air quality directly. However, such surveys can provide an indication of the level and change in the concentration of air polluting substances.

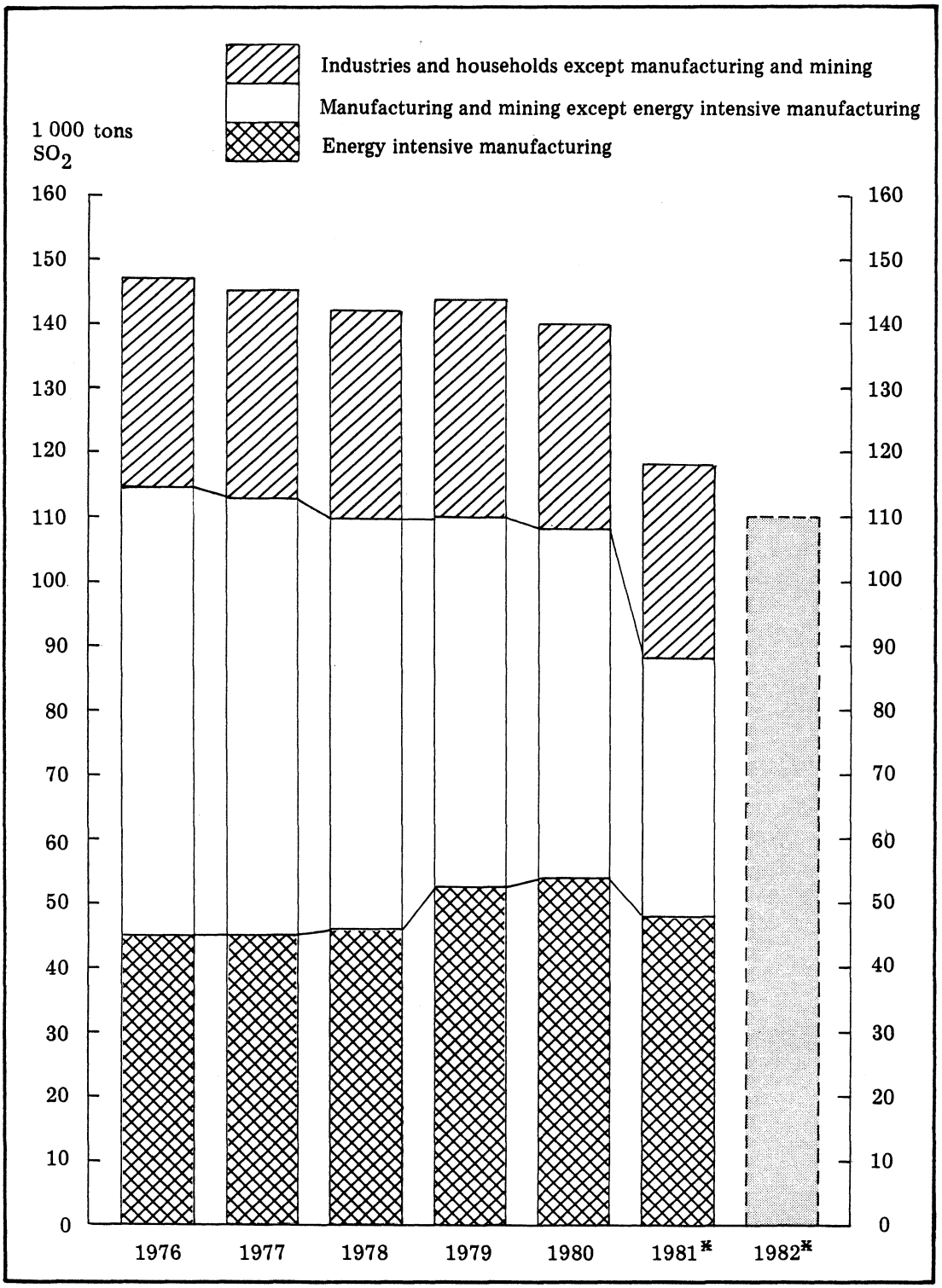
Table 14. Emissions of SO_2, NO_X and CO in Norway. 1980. 1 000 tons.

	Sulphurdioxide	Nitrogenoxide	Carbonmonoxide
	(SO_2)	(NO_X)	(CO)
Total	139.9	134.0	582
Agriculture and forestry	2.3	2.3	19
Fishing, sealing and whaling	2.5	15.0	11
Manufacturing and mining	108.2	30.0	34
Manufacture of pulp and paper products	25.8	..	..
Energy intensive manufacturing	54.2	..	..
Other manufacturing and mining	28.3	..	..
Construction	2.0	3.1	12
Trade, private and public services	7.2	17.0	81
Transport	11.1	38.0	35
Private households	6.2	28.0	390

Table 15. Emission of SO_2 in Norway. 1976 - 1982. 1 000 tons.

	1976	1977	1978	1979	1980	1981	1982
Total	147.2	145.4	141.8	143.7	139.9	118.3	110.0
Agriculture and forestry	2.6	2.6	2.7	2.7	2.3	2.1	..
Fishing, sealing and whaling	2.9	2.9	2.9	3.4	2.5	2.2	..
Manufacturing and mining	114.4	113.0	109.6	110.0	108.3	88.2	..
Manufacture of pulp and paper products	33.1	34.2	29.5	24.6	25.8	17.5	..
Energy intensive manufacturing	45.2	45.2	46.4	52.6	54.2	47.5	..
Other manufacturing and mining	36.2	33.6	33.8	32.7	28.3	23.1	..
Construction	2.0	2.2	2.0	1.9	2.1	2.1	..
Trade, private and public services	8.5	8.0	7.4	8.2	7.2	6.9	..
Transport	10.0	10.3	11.0	11.1	11.2	11.2	..
Private households	6.8	6.3	6.1	6.5	6.3	5.8	..

Figure 5. Emission of SO_2 in Norway. 1976-1982. 1000 tons



4. HYDRO POWER DEVELOPMENT. ENCHROACHMENTS AND EFFECTS ON FISH

The project "Environmental impacts of hydro power development" consists of three different parts:

1) The establishment of a river basin archive system, comprising all river reaches and lakes in Norway. This archive system makes it possible to use statistical methods to collect and compile data concerning rivers and lakes.

2) Data on technical encroachments (dams, changes in flowrate etc.) in river systems collected by means of questionnaires answered by firms in charge of the hydro power development.

3) Data on the impacts on fish collected by means of questionnaires answered by the local fishing committes.

Figure 6 illustrates how effects on the environment are being quantified indirectly. The tables 16-18 provide examples of statistics on technical encroachments. Figure 7 illustrates the changes in stock, size and catch of some fish species after hydro power development, according to answers given by local fishing committes. The stock of trout is, for example, reported to have been reduced in more than 60 per cent of the regulated reservoirs, whereas the stock of char has generally increased.

Figure 6. Encroachments and effects

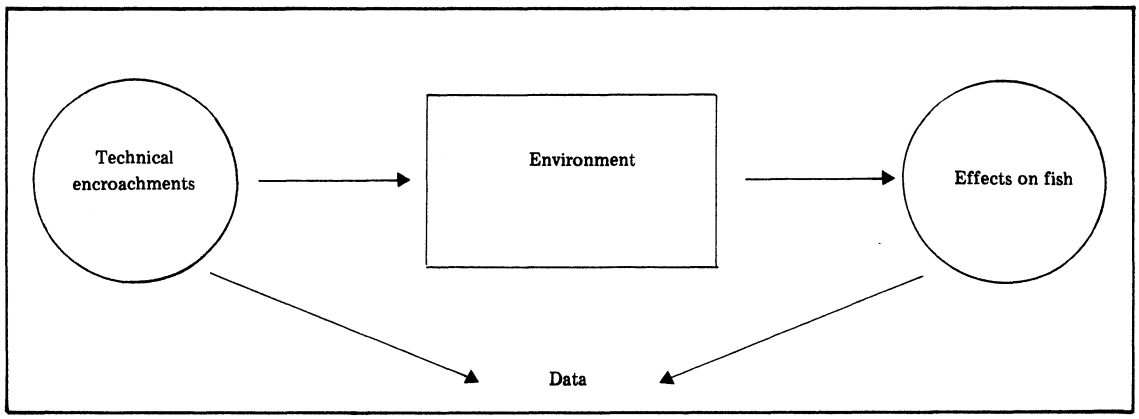


Table 16. Reservoirs developed at 1 January 1981, by period of development and regulation amplitude

	Total	Developed					Undistributed
		Before 1939	1940-59	1960-69	1970-74	1975-80	
Reservoirs, total	680[1)]	97	152	186	66	63	116
Regulation amplitude, m							
0-4	153	34	35	31	11	7	35
5-9	148	33	41	42	6	6	20
10-19	164	16	43	60	14	14	17
20-39	140	8	30	41	28	16	17
40 and more	54	2	1	11	7	19	14
Undistributed	21	4	2	1	-	1	13
				Per cent			
Reservoirs, total	100	100	100	100	100	100	100
Regulation amplitude, m							
0-4	23	35	23	17	17	11	30
5-9	22	34	27	23	9	10	17
10-19	24	17	28	32	21	22	15
20-39	21	8	20	22	42	25	15
40 and more	8	2	2	6	11	30	12
Undistributed	3	4	1	1	-	2	11

1) In addition 130 reservoirs for which no statements have been given.

Table 17. Dammed buildings by period of development

	Total	Developed					Undistributed
		Before 1939	1940-59	1960-69	1970-74	1975-80	
Total[1)]	1 088	16	145	510	149	200	68
Dammed buildings							
- in use before regulation	127	2	6	100	2	17	-
- not in use before regulation	25	-	1	4	1	19	-
Dammed cottages							
- in use before regulation	430	5	37	173	73	100	42
- not in use before regulation	7	-	1	-	2	2	2
Dammed barns etc.							
- in use before regulation	393	8	86	186	56	45	12
- not in use before regulation	106	1	14	47	15	17	12

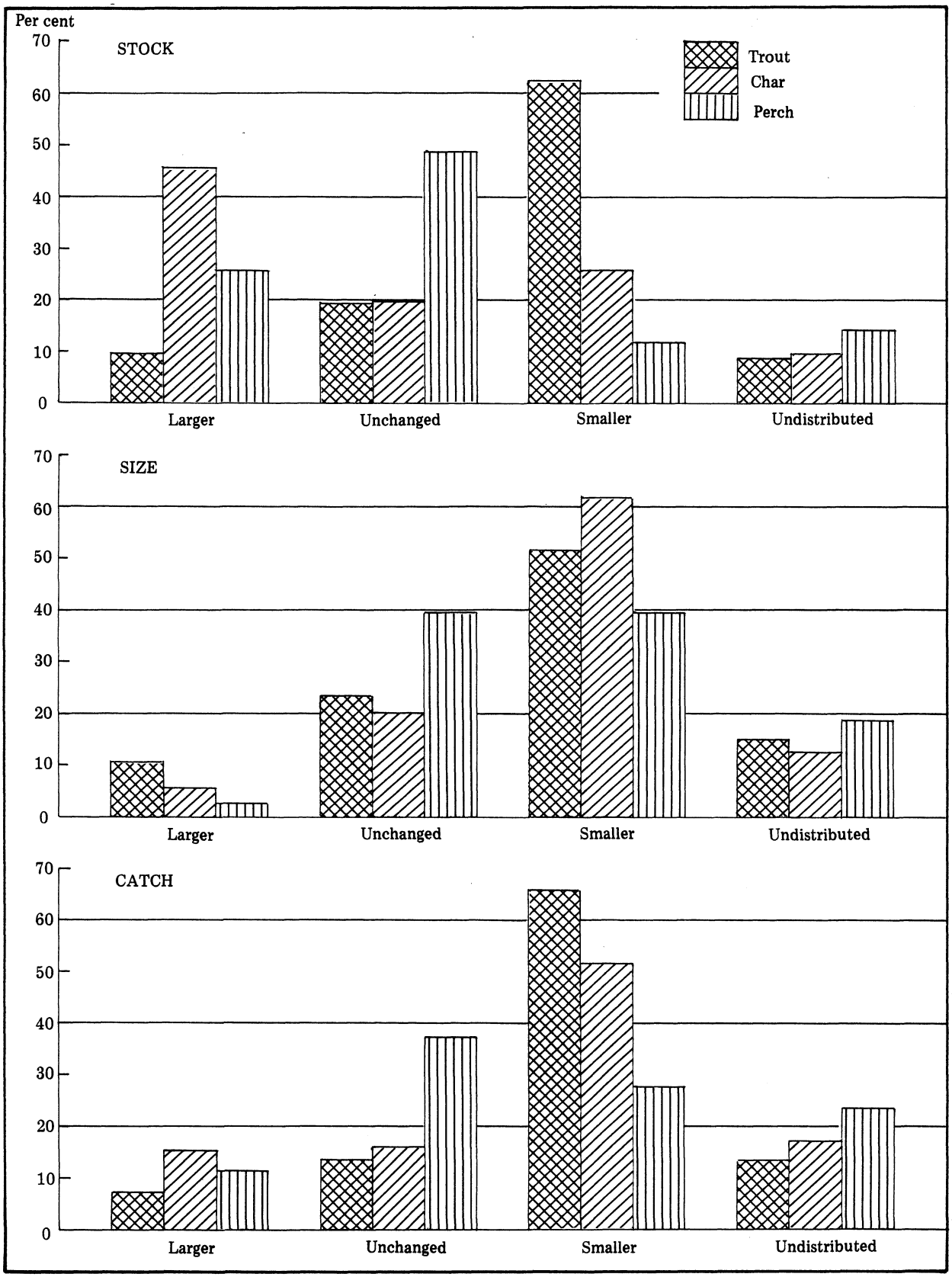
1) A total of 127 reservoirs.

Table 18. Regulated rivers at 1 January 1981, by period of development and change in mean annual rate of water flow.

	Total	Developed					Undistributed
		Before 1939	1940-59	1960-69	1970-74	1975-80	
				Km			
Total	8 812[1)]	455	1 098	2 537	1 824	912	1 986
Mean annual rate of flow after regulation in per cent of rate before regulation:							
0-9.9	1 010	37	107	550	76	79	161
10.0-49.9	1 977	22	121	681	497	206	450
50.0-89.9	1 268	5	46	398	418	165	236
90.0-109.9	2 332	184	320	571	584	329	344
110 or more	654	2	328	85	146	43	50
Undistributed	1 571	205	176	252	103	90	745
				Per cent			
Total	100	100	100	100	100	100	100
0-9.9	12	8	10	22	4	9	8
10.0-49.9	22	5	11	27	27	23	23
50.0-89.9	14	1	4	16	23	18	12
90.0-109.9	27	41	29	23	32	36	17
110 or more	7	1	30	3	8	5	3
Undistributed	18	45	16	10	6	10	38

1) Corresponds to approximately 70 per cent of all affected rivers (in km).

Figure 7. Change in stock, size and catch of fish after hydro power development



5. MINERALS

Known and economically recoverable Norwegian metal reserves have decreased during the preceding years due to decreasing prices as relative to production costs. This is particularly the case for iron reserves. Accordingly, the extraction of metals have decreased.

The reserve figures in table 19 include minimum and maximum values, reflecting the uncertainly when estimating the reserves on the basis of ore samples and geological information. The interval between the minimum and maximum value is a 90 per cent confidence interval, covering the true value with a probability of 90 per cent.

Table 19. Known and economic reserves of metals in Norway 1 January 1982. 1 000 tons of metal.

		Min. estimate	Unbiased estimate	Max. estimate
Iron	Recoverable reserves	52 000	78 000	130 000
	Net extraction in 1982		2 171	
Titan-oxide-	Recoverable reserves	16 800	18 500	20 400
	Net extraction in 1982		252	
Copper	Recoverable reserves	196	280	420
	Net extraction in 1982		28	
Zink	Recoverable reserves	231	330	495
	Net extraction in 1982		33	
Lead	Recoverable reserves	18	25	38
	Net extraction in 1982		3	

Table 20. Reserve accounts for some important metals. 1980 - 1981. 1 000 tons of metal

	Iron		Titan oxide		Copper		Zink		Lead	
	1980	1981*	1980	1981*	1980	1981*	1980	1981*	1980	1981
Recoverable reserves 1/1 ...	157 000	151 000	20 000	19 000	502	390	535	445	46	28
Extraction	-2 500	-2 600	-369	-293	-29	-28	-27	-33	-2	-3
Revaluation	-3 200	-71 000	-431	-407	-83	-82	-63	-82	-16	-
Recoverable reserves 31/12 .	151 600	78 000	19 200	18 500	390	280	445	330	28	25

Table 21. Supply of metals produced in Norway 1980 - 1982. 1 000 tons of metal

	Iron			Titan oxide		
	1980	1981*	1982*	1980	1981*	1982*
Extraction	2 480	2 595	2 171	369	293	252
Imports	56	7	32	0	0	0
Exports	-1 738	-2 223	-1 675	-347	-276	-206
Domestic supply[1]	798	268	528	22	17	46
Value of exports	389	567	450	110	98	83
Value of imports	11	3	9	0	0	0

	Copper			Zink			Lead		
	1980	1981*	1982*	1980	1981*	1982*	1980	1981*	1982*
Extraction	29	28	28	27	30	33	2	3	3
Imports	0	0	0	43	58	54	0	0	0
Exports	-23	-25	-27	-3	-10	-12	-2	-3	-4
Domestic supply[1]	6	3	1	67	78	75	0	0	-1
Value of exports. Mill kr	165	163	152	7	32	45	13	13	15
Value of imports. Mill kr	0	0	0	87	170	197	0	0	0

1) Includes domestic use and stock changes.

Table 22. Supply of selected metals and minerals 1980 - 1982. 1 000 tons

	Manganese			Quartz			Nepheline syenite			Phosphate		
	1980	1981*	1982*	1980	1981*	1982*	1980	1981*	1982*	1980	1981*	1982*
Extraction	0	0	0	844	..	..	231	217	208	0	0	0
Imports	808	485	740	551	505	628	0	0	0	477	402	471
Exports	-2	-3	0	-63	-59	-201	-227	-228	-201	0	0	0
Domestic supply[1]	806	482	740	1 332	..	..	4	-11	-7	477	402	471
Value of exports. Mill kr	3	3	0	3	4	11	40	41	37	0	0	0
Value of imports. Mill kr	276	212	327	84	80	90	0	0	0	162	173	190

1) Includes domestic use and stock changes.

6. FOREST

Norwegian logging and roundwood supply decreased from 1981 to 1982. The logging in 1981, however, was at the next highest level ever recorded in Norway.

During the last 10 years the discharges of waste and pollutants from the manufacturing of wood products have decreased with 70 per cent, mainly as a result of improved anti pollution measures and new technology in chemical pulp manufacturing (table 26).

Table 23. Growing stock, increment and depletion. 1981. Mill m^3 including bark.

	Total	Spruce	Pine	Broad-leaved
Growing stock 1/1	586.0	300.0	180.0	106.0
Increment	19.4	10.1	5.0	4.3
Depletion[1]	14.3	10.3	2.2	1.9
Growing stock 31/12	591.1	299.8	182.8	108.4

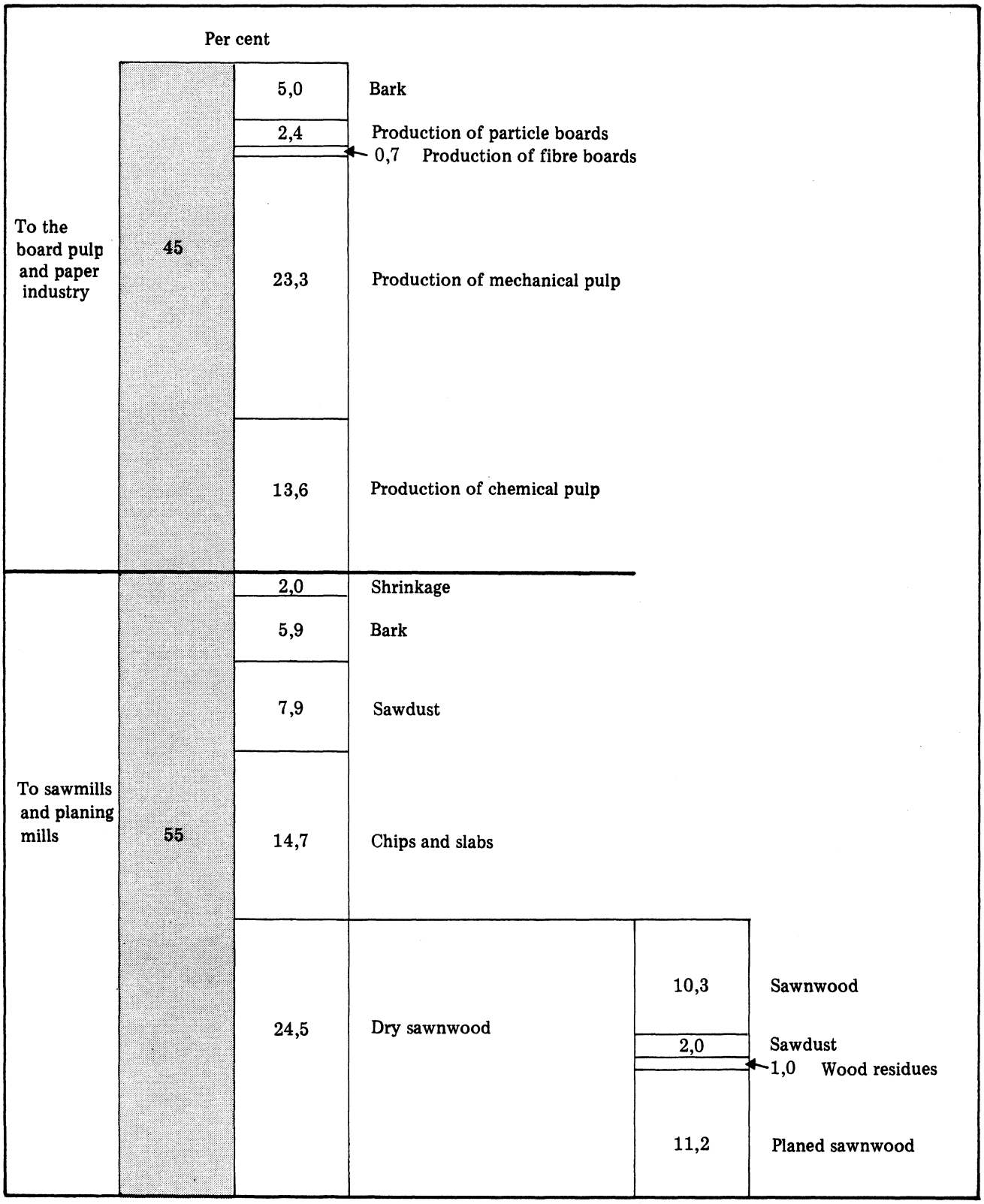
1) Including natural depletion (8 per cent of the increment), logging residues (6 per cent of the roundwood cut) and fuelwood cut of 1,2 mill. m^3.

Table 24. Domestic wood supply 1980 - 1982. 1 000 m^3

	Saw logs[1]			Pulpwood[1]			Chips, slats incl. sandust		
	1980	1981*	1982*	1980	1981*	1982*	1980	1981*	1982*
Roundwood cut[2]	5 650	6 269	5 505	3 834	4 458	2 879	-	-	-
Imports	234	212	153	784	805	684	458	491	605
Exports	-351	-191	-168	-476	-482	-459	-249	-295	-159
Stock changes	14	-42	22	-112	-91	234	-	-	-
Domestic wood supply	5 547	6 248	4 030	4 030	4 690	4 338	209	196	446

1) Roundwood is calculated over bark. 2) The roundwood cut is calculated for the felling season, August- July. Fuelwood cut is not included.

Figure 8. Utilization of an average timber log in the forest industry



Source: The Norwegian Institute of Wood Working and Wood Technology 1978, and the forest resource account of 1980.

Table 25. Manufacturing and domestic supplies of sawnwood, boards, pulp and paper. 1980 - 1982

	Sawnwood			Particle board			Fibre board		
	1980	1981*	1982*	1980	1981*	1982*	1980	1981*	1982*
	1 000 m^3			1 000 t					
Production in wood processing industries[1]	2 187	2 233	2 100	239	228	230	121	115	108
Use in wood processing industries	-1	-1	-1	-	-	-	-1	-1	-1
Imports	424	454	580	53	56	49	7	4	4
Exports	-429	-247	-329	-40	-33	-26	-21	-26	-22
Stock changes and statistical errors[2]	395	134	236	-	-	-2	-	15	19
Use in other sectors	2 576	2 573	2 586	252	251	251	106	107	108

	Mechanical pulp[3]			Chemical pulp[3]			Paper and paperboard		
	1980	1981*	1982*	1980	1981*	1982*	1980	1981*	1982*
	1 000 t								
Production in wood processing industries[1]	976	979	982	507	629	587	1 312	1 290	1 212
Use in wood processing industries	-703	-690	-654	-546	-536	-509	-8	-7	-5
Imports	3	7	9	351	274	227	192	217	248
Exports	-246	-215	-183	-284	-344	-367	-1 090	-1 070	-1 077
Stock changes and statistical errors[2]	-27	-78	-151	7	12	96	424	407	462
Use in other sectors	3	3	3	35	35	34	830	837	840

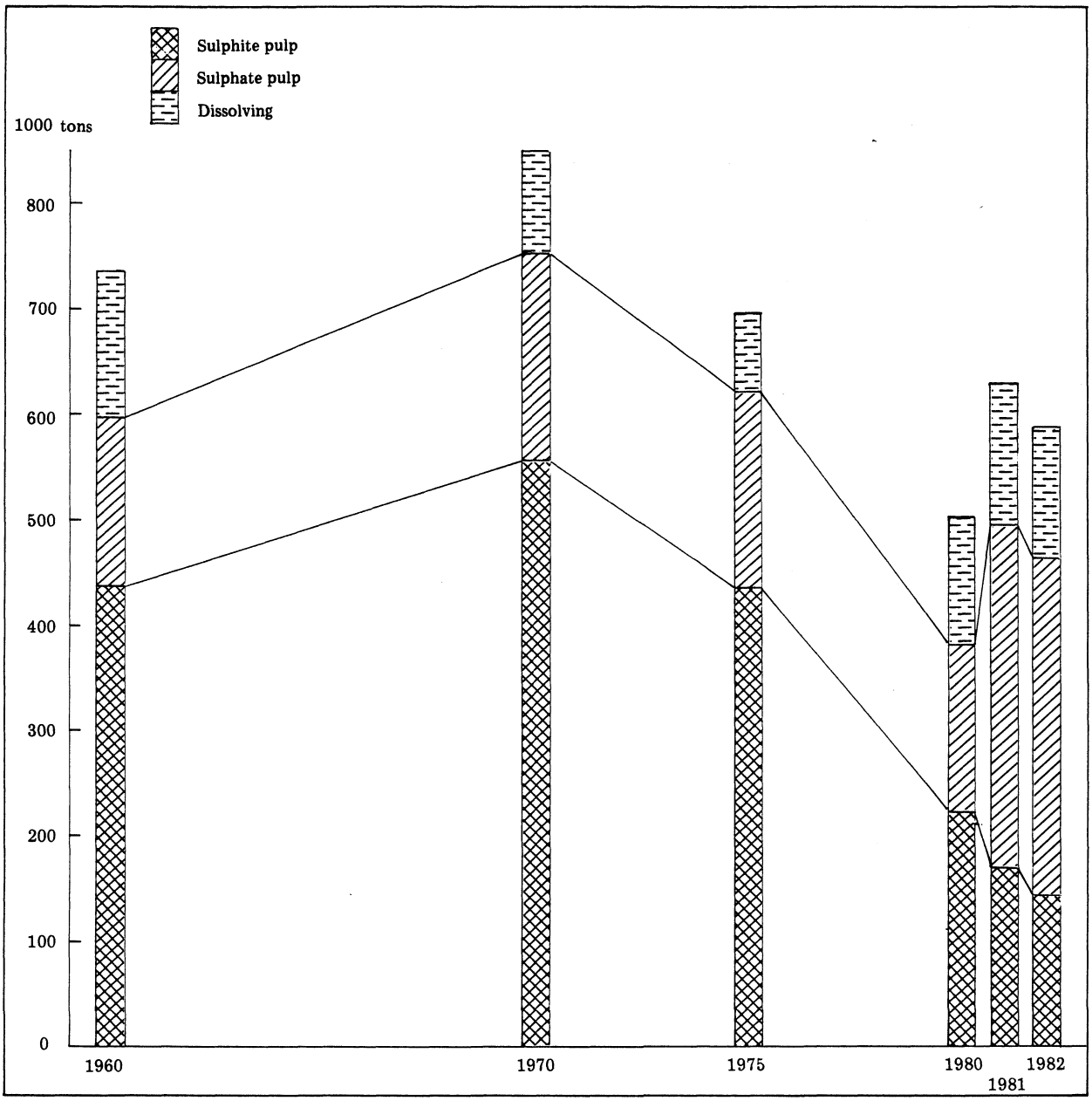
1) The sectors are: Manufacturing of particle board, fibre board, pulp and paper. 2) Residual item. There is a considerable supply of sawnwood and paper from other sectors. 3) Converted to dry weight.

Tabell 26. Emission to water of fibre and soluted organic matter from the pulp and paper industry. Tons

	Total	Of which from the manufacturing of chemical pulp
1972	601 000	470 000
1977	381 000	290 000
1979	256 000	160 000
1981	167 000	70 000

Source: The Norwegian Pulp and Paper Research Institute, 1982.

Figure 9. Production of chemical pulp, 1960-1982



Source: The Economic Institute of the Norwegian Pulp and Paper Industry, 1982.

7. FISH

The stock of North-East Arctic cod was approximately 1,4 million tons at the beginning of 1982 and is assumed to be 1,3 million tons at the beginning of 1983. This is the lowest level recorded after World War II.

The spawning stock of North-East Arctic cod increased from 1981 to 1982, as the 1975 year-class matured. The year classes 1976 - 1981 are poor, while the 1982 year-class is richer. This year-class, however, will not be recruited to the spawning stock before 1989/90.

The number of fish in each year class is reestimated every year (VPA-analysis). The stock is thus revaluated several times. The yearly revaluation may give some ideas of the precision of these estimates. Table 27 and 28 are based on the first estimates of the cod and haddock stocks, and show the changes due to catch, natural mortality, increment, recruitment and revaluation.

Table 29 and 30 compare the yearly catches of some important fish stocks and species with the quotas or recommendations from the International Council for the Exploration of the Sea (ICES). The catch quota for North-East Arctic cod was overfished in 1981 and 1982, mainly because of the Norwegian fishing with passive gears. The regulation agreement between USSR and Norway has not included this kind of fishing. Most of the Norwegian catch is exported. Table 32 and 33 give figures for the most important fish products. The export of stock fish declined with more than 40 per cent from 1981 to 1982. This was due to problems with exports to Nigeria.

Table 27. Accounts[1] of th North-East Artic cod stock. Fish which are more than 2 years of age by the turn of the year. 1975 - 1982. 1 000 tons

Year	Stock 1/1	Catch	Natural mortality	Increment	Recruitment	Revaluation	Stock 31/12
1975	3 600	-830	-950	1 370	900	20	4 110
1976	4 110	-870	-630	970	270	-1 350	2 500
1977	2 500	-910	-560	720	310	-140	1 920
1978	1 920	-700	-460	650	210	70	1 690
1979	1 690	-440	-460	590	130	-	1 500
1980	1 500	-380	-390	610	70	150	1 560
1981	1 560	-400	-280	520	120	-110	1 410
1982	1 410	..	..	..	..	..	..

1) First evaluation

Figure 10. Total stock and spawning stock for North-East Arctic cod

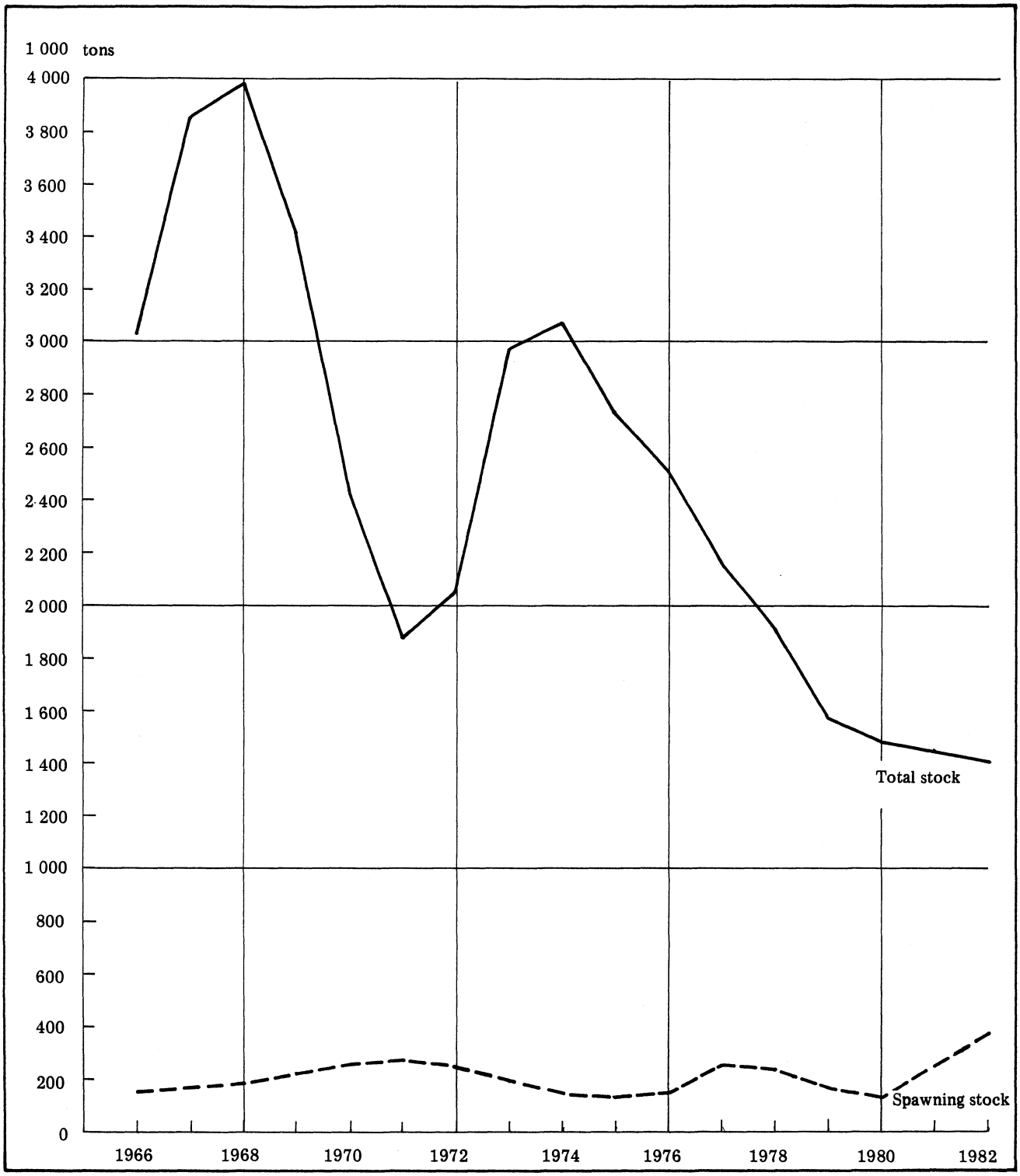


Figure 11. Recruitment index for North-East Arctic cod

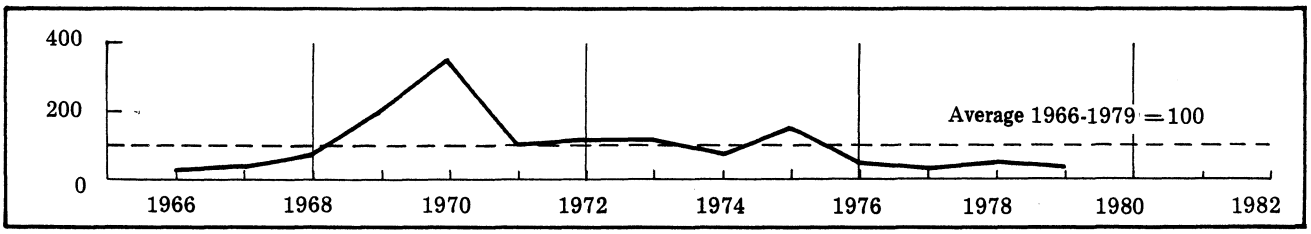


Figure 12. Total stock and spawning stock for North-East Arctic haddock

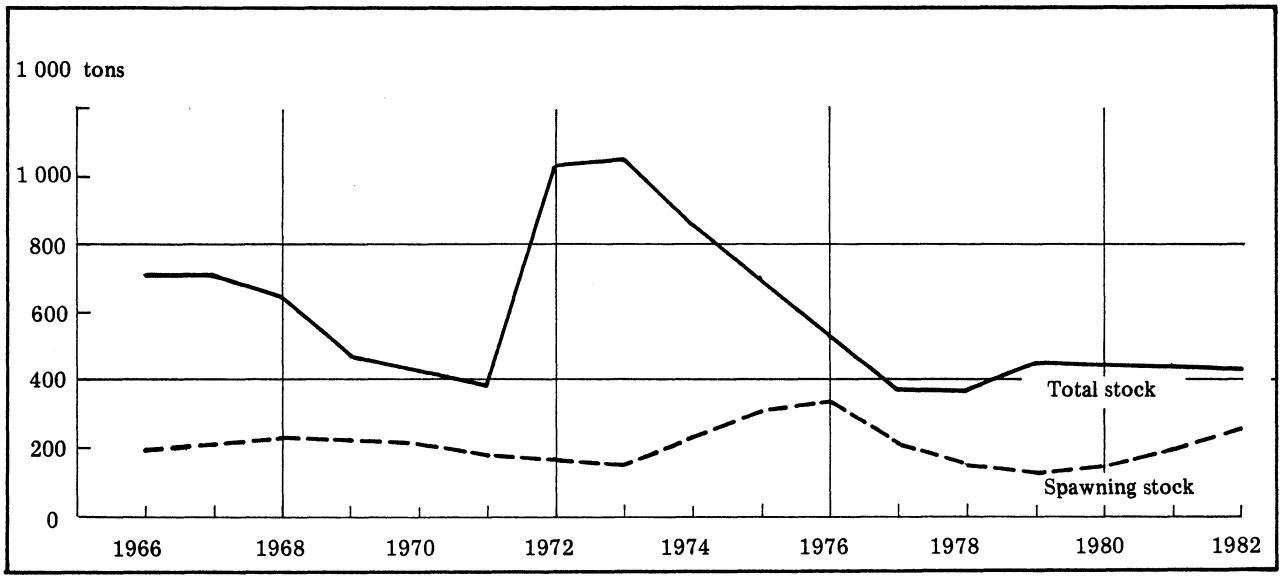


Figure 13. Recruitment index for North-East Arctic haddock

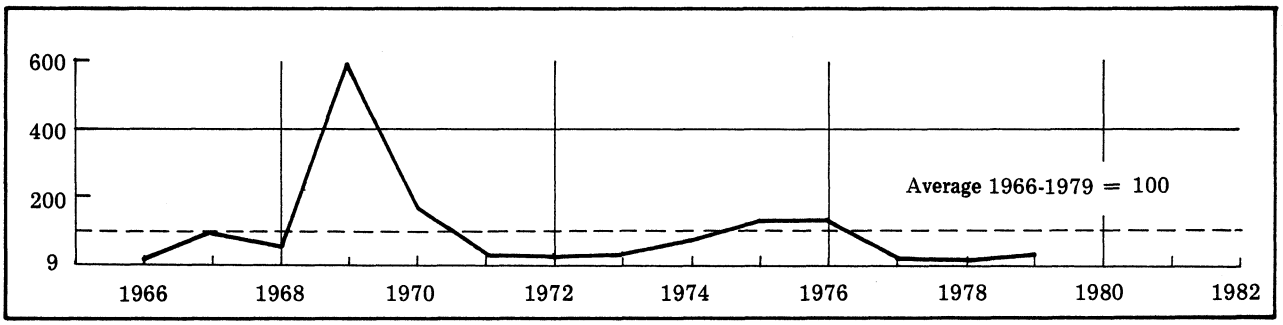


Table 28. Accounts[1)] of the North-East Arctic haddock. Fish which are more than 2 year of age by the the turn of the year. 1978 - 1982. 1 000 tons

	Stock 1/1	Catch	Natural mortality	Increment	Recruitment	Revaluation	Stock 31/12
1978	200	-100	-100	100	150	130	380
1979	380	-100	-90	180	30	30	430
1980	430	-90	-90	150	30	-	440
1981	440	-80	-90	110	40	10	430
1982	430	..	..	..	..	..	..

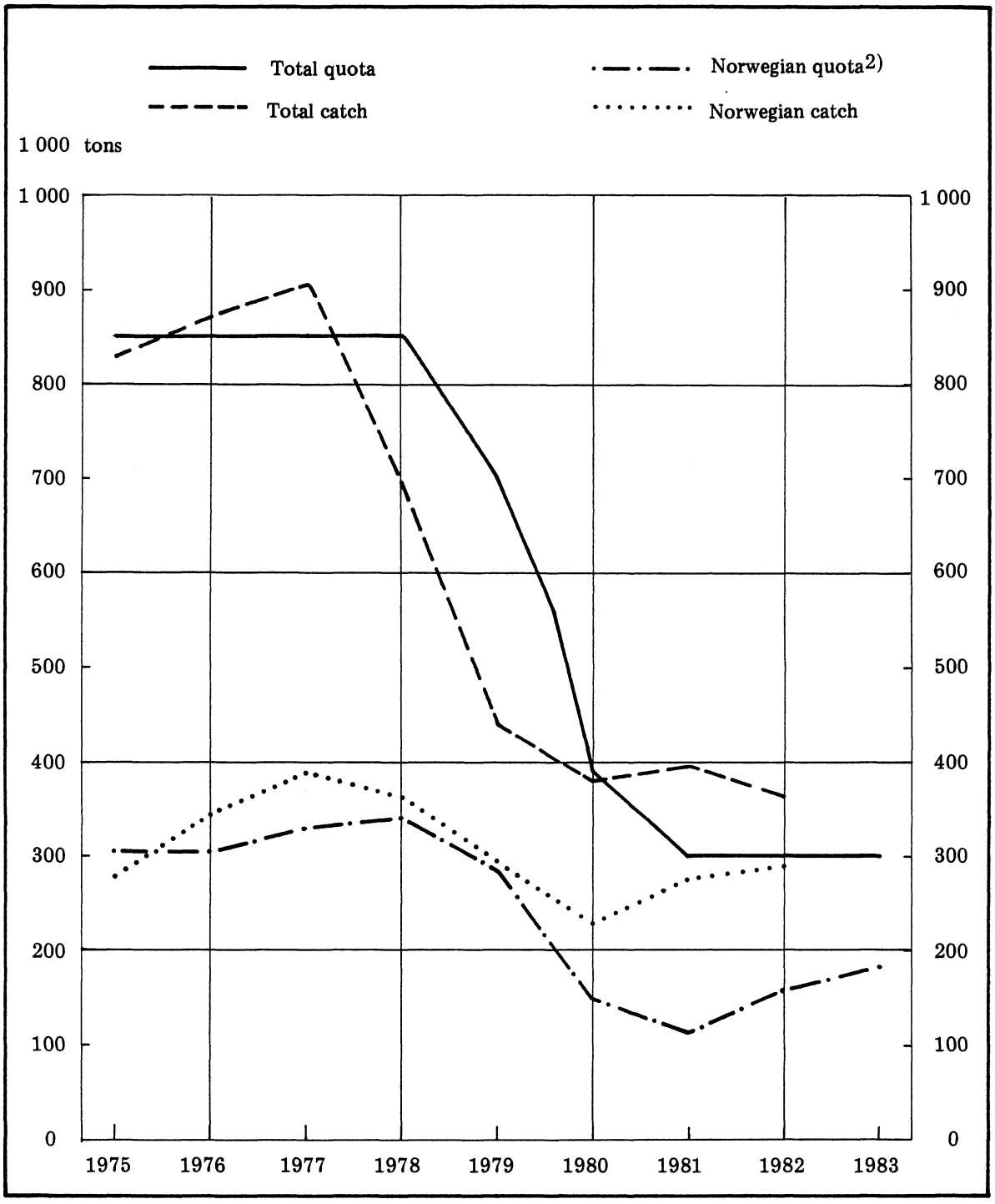
1) First evalution.

Table 29. Quotas and catch of North-East Arctic cod, North-East Arctic haddock, North-East Arctic saithe and capelin in the Barents Sea. 1970 - 1982. 1 000 tons

Year	North-East Arctic cod		North-East Arctic haddock		North-East Arctic saithe		Capelin in the Batents sea	
	Quota[1)]	Catch	Quota	Catch	Quota	Catch	Quota	Catch
1970	.	933	.	87	.	236	.	1 314
1971	.	689	.	78	.	224	.	1 392
1972	.	565	.	265	.	207	.	1 593
1973	.	793	.	320	.	212	.	1 336
1974	.	1 102	.	221	.	264	.	1 149
1975	850	829	.	176	.	233	.	1 417
1976	850	867	.	137	.	242	.	2 546
1977	850	905	120	110	200	183	.	2 940
1978	850	699	150	94	160	155	.	1 897
1979	700	441	206	104	153	164	1 800	1 783
1980	390	382	75	87	122	145	1 600	1 649
1981	300	399	110	77	123	172	1 900	1 987
1982	300	366*	110	49*	130	..	1 700	..
1983	300		77		130		2 300	

1) Including Murman cod. The Norwegian fishing of coastal cod is not included. 2) Recommended by the International Council for the Exploration of the Sea.

Figure 14. Quotas and catch. North-East Arctic cod[1]. 1975-1983



1) Norwegian coastal cod is not included.

2) Including assignments of USSR's quota and exchange-agreements. Refers to 1981, 982 and 1983.

Table 30. Quotas, recommendations and catch. North Sea mackerel. 1970 - 1982. 1 000 tons

Year	The North Sea Area[1]			North Sea mackerel	
	Recommendations[2] of the ICES	Quota	Catch	Recommendations[3] of the ICES	Catch[4]
1970	.	.	323	.	287
1971	.	.	244	.	84
1972	.	.	188	.	118
1973	.	.	348	.	211
1974	.	.	305	.	187
1975	.	.	298	.	179
1976	249	.	316	132	174
1977	220	.[5]	260	.	188
1978	145	145	154	60	108
1979	145	145	158	60	66
1980	0	55	96	0	73
1981	0	40	77	0	60
1982	0[6]	25	..	0	..
1983	0[6]	30		0	

1) Statistical areas IV, IIIa and IIa. 2) Maximum catch recommended by the International Council for the Exploration of the Sea (ICES). 3) Estimate from the ICES of to what extent the maximum catch recommended for the North Sea Areas will affect the North Sea Stock. 4) Including 1-year-group-catches. 5) There was an agreement on keeping the catches at the same level as previous year. 6) Statistical areas IV and IIIa.

Table 31. Norwegian catch by groups of fish species. 1979 - 1982. 1 000 tons

	1979	1980	1981	1982*)
Total	2 600	2 338	2 478	2 370
Cod	335	281	339	340
Saithe	160	177	222	220
Haddock	74	68	66	47
Other codfish	67	73	63	61
Flatfish	6	5	6	5
Other fish for consumption (including eel and salmon)	29	26	22	23
Capelin	1 232	1 118	1 347	1 150
Mackerel	125	77	62	73
Herring etc. — Herring	12	17	23	36
Herring etc. — Sprat	89	77	10	30
Other industrial fish species	471	419	318	385

Table 32. Exports of fish products. Codfish, flatfish, other fish for consumption[1]. 1977 - 1982. 1 000 tons

	Fresh	Round-frozen	Fillet	Salted fish	Klip-fish	Stock-fish
Total:						
1977	10.1	5.4	85.9	8.7	64.8	12.4
1978	13.0	6.8	86.4	10.6	53.4	15.0
1979	12.8	6.6	80.4	18.5	58.9	23.2
1980	14.2	6.0	66.6	11.8	52.1	21.2
1981	15.0	4.8	73.7	8.9	56.3	29.2
1982	15.4	5.6	72.9	9.9	58.6	16.0
Cod:						
1977	0.2	0.2	58.3	6.8	31.2	7.3
1978	1.8	1.4	57.4	8.7	26.7	9.6
1979	1.1	1.7	48.5	15.6[2]	30.1	14.4
1980	0.9	0.9	30.8	9.6[2]	22.5	11.8
1981	0.5	0.2	30.7	7.1	25.4	15.5
1982*	0.5	0.3	33.7	7.2	30.3	9.2
Saithe:						
1977	0.8	0.0	15.0	1.1	19.4	1.3
1978	1.9	0.0	16.6	1.2	14.3	1.4
1979	2.4	0.7	16.5	1.5	15.3	4.3
1980	3.7	0.9	17.9	1.2	15.0	5.1
1981	7.6	0.9	23.3	1.0	19.1	8.8
1981*	7.5	1.0	24.5	1.3	15.9	4.2
Haddock:						
1977	0.9	0.3	10.0	-	0.1	0.0
1978	1.5	0.4	9.3	0.1	0.2	0.1
1979	2.8	0.8	11.8	0.2	0.9	0.4
1980	3.0	0.5	15.0	0.1	0.8	0.5
1981	2.6	0.9	16.8	0.1	0.6	0.8
1982*	1.7	1.0	12.1	0.0	0.2	0.4
Other codfish						
1977	3.7	0.1	0.1	0.8	14.1	3.8
1978	3.1	0.4	0.0	0.6	12.2	3.9
1979	2.4	0.0	0.0	1.2	13.1	4.1
1980	2.4	0.6	0.1	0.9	13.8	3.8
1981	..	0.0	0.0	0.7	11.2	4.1
1982*	..	0.1	0.0	1.4	12.2	2.2
Flatfish and other fish for consumption:						
1977	4.5	4.8[3]	2.5	-	-	-
1978	4.7	4.6[3]	3.1	-	-	-
1979	4.1	3.4[3]	3.6	-	-	-
1980	4.2	3.1[3]	2.8	-	-	-
1981	4.3	2.8[3]	2.9	-	-	-
1982*	5.7	3.2	2.6	-	-	-

1) Redfish, catfish, picked dogfish, porbeagle etc. 2) Including salted fillet. 3) Including salted and smoked fish and belly walls of picked dogfish.

Table 33. Exports of fish products. Capelin, herring and sprat, mackerel, other industrial[1] fish species. 1977 - 1982. 1 000 tons

	Fresh	Round-frozen	Fillet	Salted, smoked	Canned	Fish meal	Fish oils
Total:							
1977	2.3	30.6	2.6	4.5	17.8	461.6	120.8
1978	5.9	33.4	0.1	5.1	16.5	284.4	64.0
1979	11.5	50.1	0.1	3.8	14.8	326.8	79.0
1980	4.8	48.6	0.0	2.7	13.9	275.2	79.4
1981	9.6	53.9	0.3	4.7	15.0	266.5	107.3
1982*	28.8	69.7	1.4	4.2	10.5	208.0	85.5
Capelin:							
1977	-	4.9[2]	-	-	-	..	..
1978	0.0	1.4[2]	-	-	-	..	..
1979	-	9.3[2]	-	-	-	..	..
1980	-	15.5[2]	-	-	-	..	..
1981	0.4	20.2[2]	-	-	-	..	..
1982*	3.7	23.7[2]	-	-	-	..	..
Herring and sprat:							
1977	1.5	8.1	2.6	4.5	16.9	..	..
1978	3.9	6.2	0.1	5.1	15.6	..	..
1979	5.0	2.3	0.1	3.8	13.8	..	..
1980	3.5	0.6	0.0	2.7	12.9	..	..
1981	8.1	1.2	0.3	4.7	13.9	..	..
1982*	22.8	2.1	1.4	4.2	9.5	..	..
Mackerel:							
1977	0.8	17.6	..	0.0	0.9	..	..
1978	2.0	25.8	..	0.0	0.9	..	..
1979	6.5	38.5	..	0.0	1.0	..	..
1980	1.3	32.5	..	0.0	1.0	..	..
1981	1.1	32.5	..	0.0	1.1	..	..
1982*	2.3	43.9	..	0.0	1.0	..	..

1) Norway port, sandeel, blue whiting etc. Most of the catch is used for fish meal and oils.
2) Including capelin with roe.

Table 34. Export value of fish and fish products[1]. 1977 - 1982.

	Total		Fresh	Round-frozen	Fillet	Salted, smoked	Klip-fish and stock-fish	Prepared or canned	Fish meal	Fish oils	Other fish products
	Mill.kr.		Per cent								
1977	4 499	100.0	2.4	3.7	18.4	4.3	20.7	9.6	24.2	5.9	10.8
1978	4 208	100.0	4.3	4.7	21.4	5.1	21.2	10.7	16.4	3.5	12.7
1979	4 772	100.0	5.7	6.4	18.5	5.0	23.6	9.5	14.5	3.6	13.2
1980	5 054	100.0	5.7	5.8	15.3	4.5	26.9	9.7	13.5	3.6	15.0
1981	5 633	100.0	6.5	6.2	15.2	4.0	33.3	9.6	13.8	4.3	7.1
1982	5 508	100.0	9.1	8.4	15.9	5.7	29.9	8.1	9.8	3.4	9.7

1)Including a few more products than those mentioned in table 32 and 33.

Table 35. Export value of fish and fish products[1] in proportion to other commodity export. 1977 - 1982.

	Total Norwegian commodity export	Excl. crude oil, natural gas, ships and oil platforms etc.	Fish and fish products	Fish and fishproducts of total commodity export	Fish and fish products in percentage of commodity export excl. crude oil, natural gas, ships and platforms etc.
	Million kroner			Per cent	
1977	47 262	30 320	4 499	9.5	14.8
1978	57 084	33 028	4 208	7.4	12.7
1979	68 527	41 052	4 772	7.0	11.6
1980	91 672	46 371	5 054	5.5	10.9
1981	104 265	51 229	5 633	5.4	11.0
1982*	113 515	41 450	5 508	4.9	10.7

1) Including a few more products than those mentioned in table 32 and 33.

8. LAND

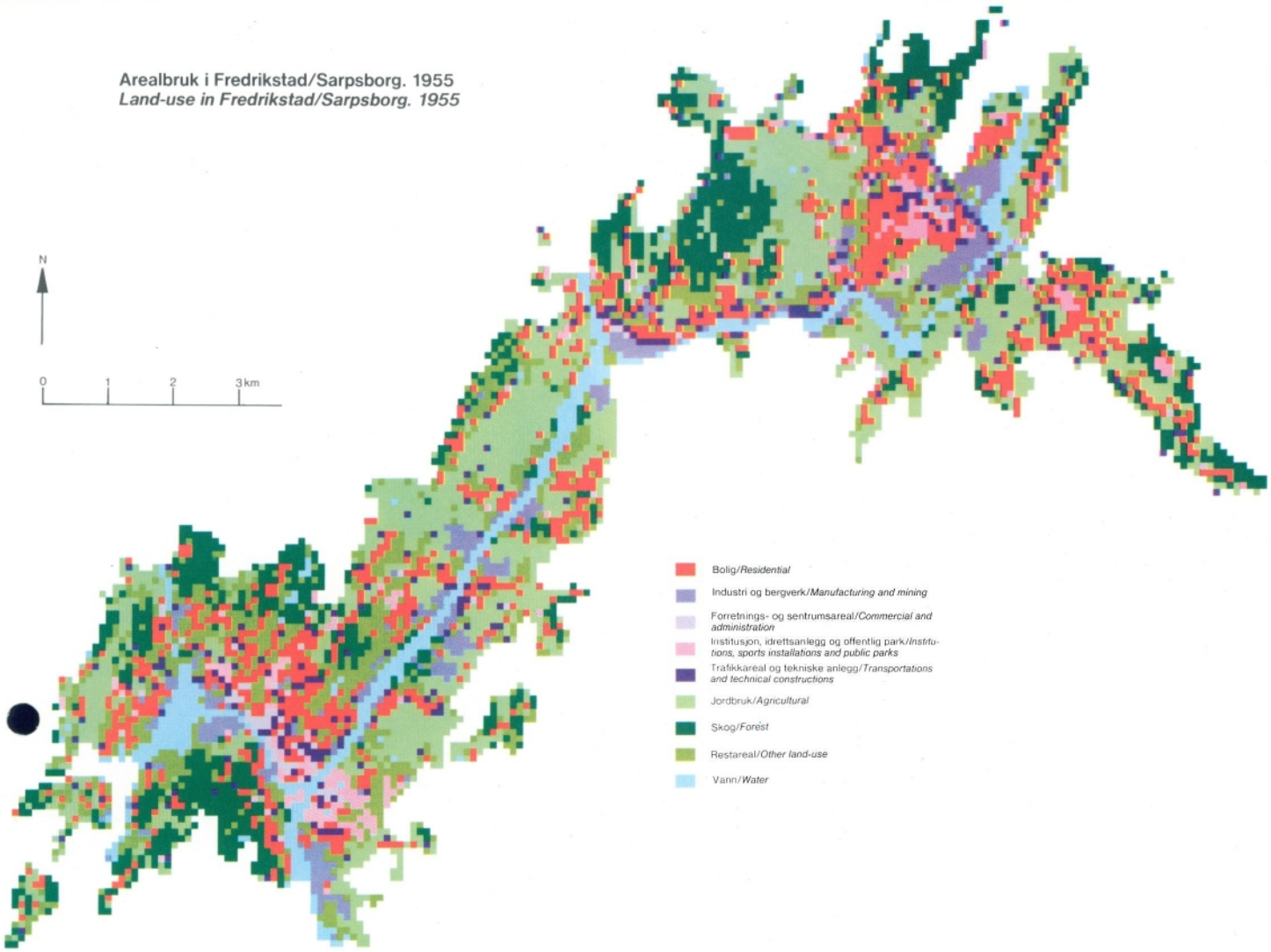
This chapter presents some statistics on the development of urban settlements in Norway during the period 1955 - 1975. The data are based on the method of point sampling on aireal photographs.

Land use maps from the conurbation of Fredrikstad and Sarpsborg in the south-east part of the country illustrate the process of urban expansion. The maps consist of squares equivalent to 100 x 100 meters in the terrain. The colour of the squares is defined by the land use in the centre (the sample point).

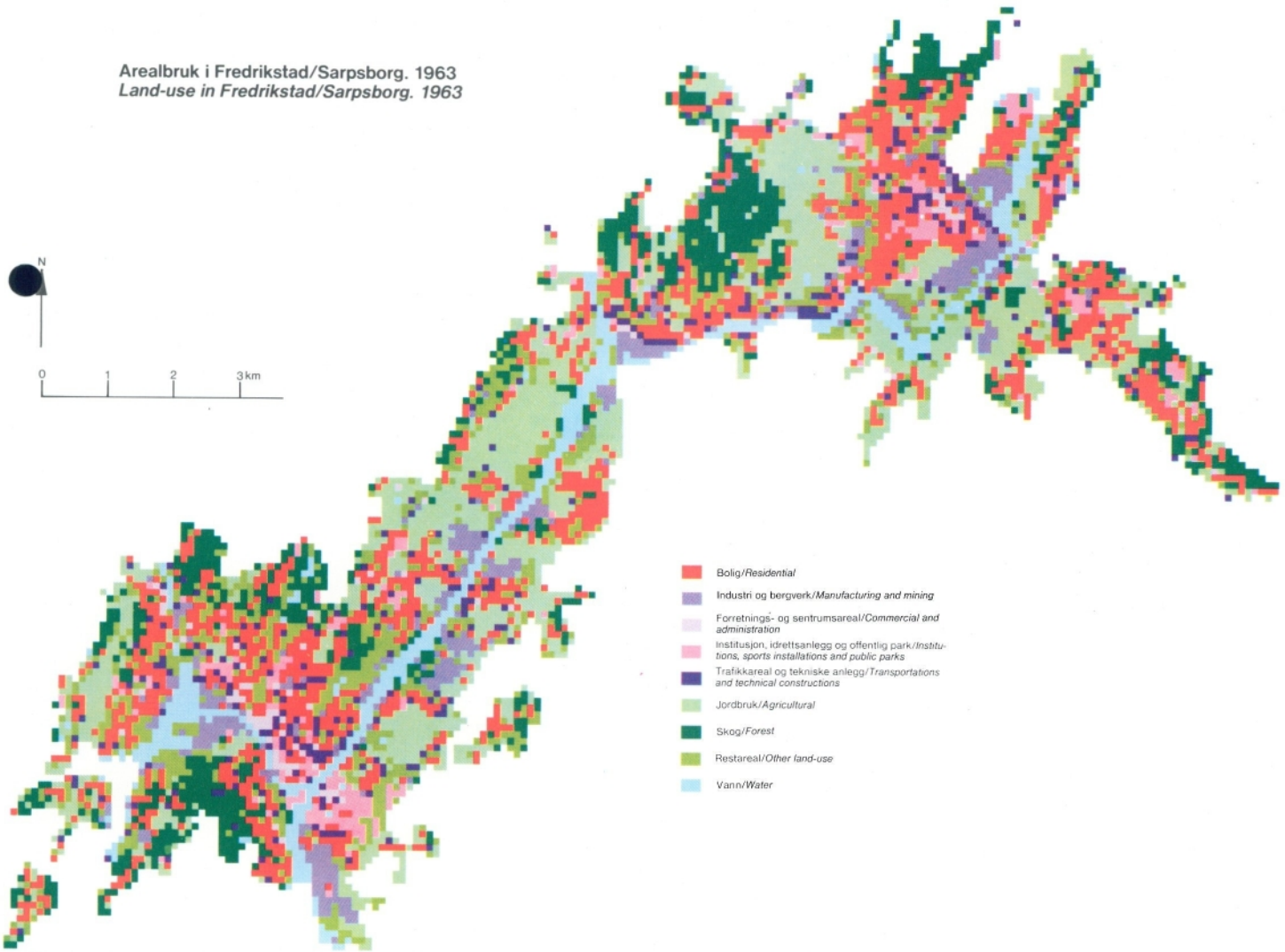
One map shows undeveloped land within residential areas, indicating where it is possible to increase the density of residential buildings. In Fredrikstad/Sarpsborg this land corresponds to 15 per cent of the land occupied by small houses. The average national figure for urban settlements is 20 per cent. The potential of increasing the building density concerns both the possibility of dividing large residential properties and of developing vacant sites in residential areas.

Some of the information from the maps are presented in the tables 36 and 37 as well, which in addition present results for the entire country.

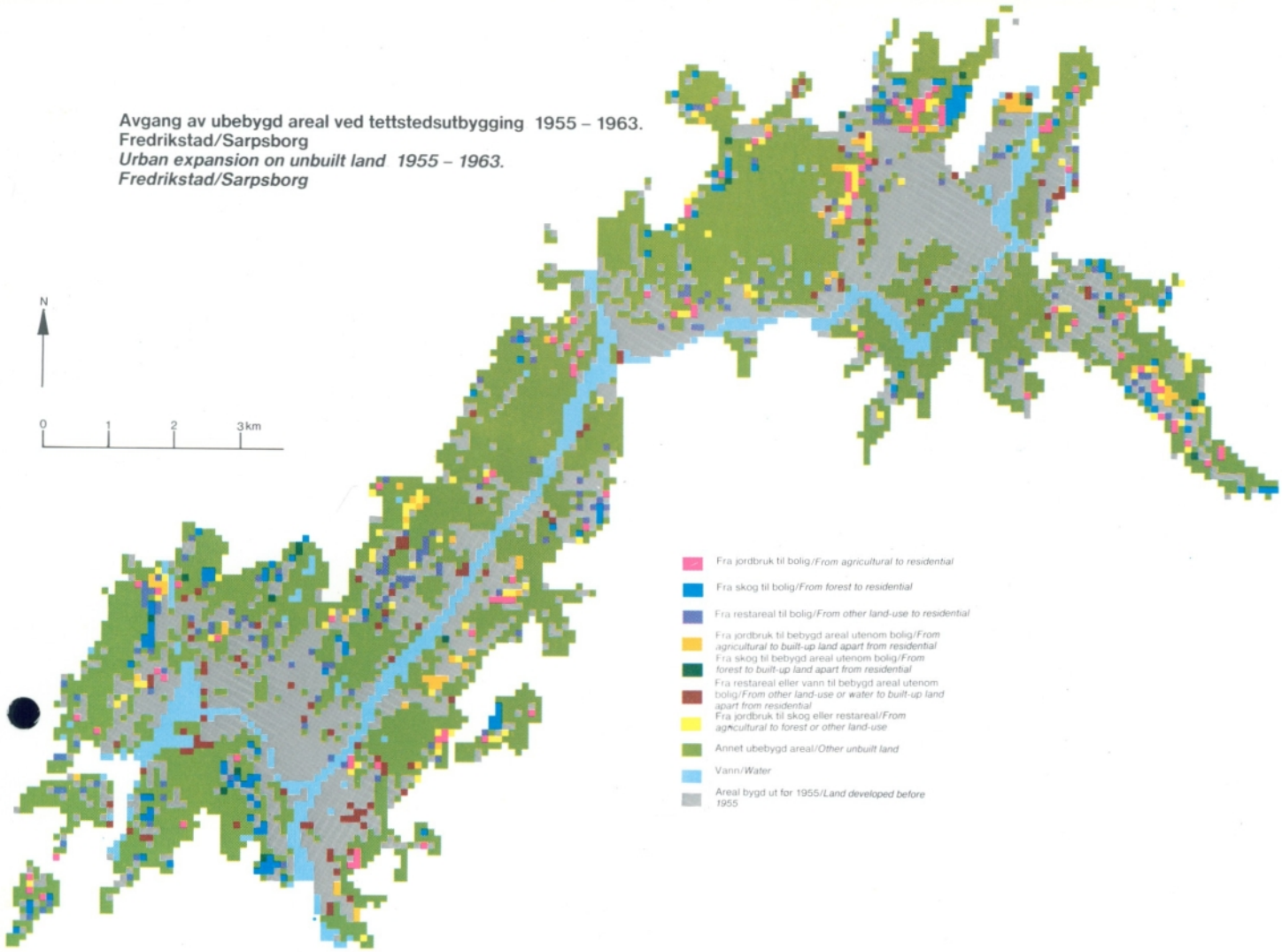
Arealbruk i Fredrikstad/Sarpsborg. 1955
Land-use in Fredrikstad/Sarpsborg. 1955



Arealbruk i Fredrikstad/Sarpsborg. 1963
Land-use in Fredrikstad/Sarpsborg. 1963



Avgang av ubebygd areal ved tettstedsutbygging 1955 – 1963.
Fredrikstad/Sarpsborg
Urban expansion on unbuilt land 1955 – 1963.
Fredrikstad/Sarpsborg



Avgang av ubebygd areal ved tettstedsutbygging 1963 – 1975.
Fredrikstad/Sarpsborg
Urban expansion on unbuilt land 1963 – 1975.
Fredrikstad/Sarpsborg

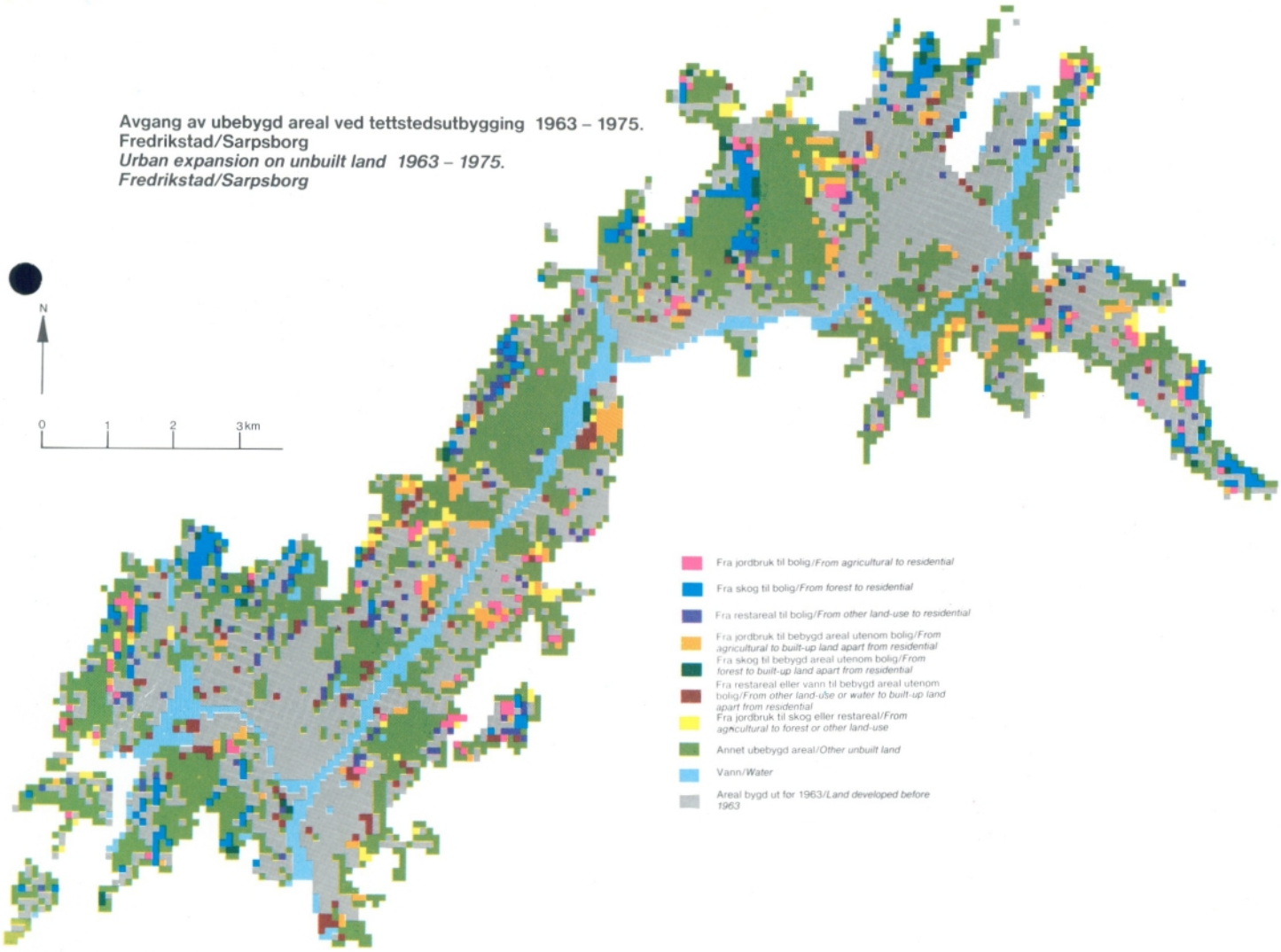


Table 36. Built-up land in urban settlements[1]. The whole country 1955, 1965 and 1975. The urban settlement Fredrikstad/Sarpsborg 1955, 1963 and 1975.

	Year	Total	Residential	Manufacturing and storehouses	Commerical and administration	Institutions, public parks, cementeries and sports installations	Transportation and technical constructions
				Hectare			
The whole country	1955	49 133	26 667	5 453	1 589	4 859	10 565
	1965	66 075	37 157	7 421	2 099	6 302	13 096
	1975	86 914	49 384	10 050	2 648	8 259	16 573
Fredrikstad/ Sarpsborg	1955	2 159	1 156	396	74	217	316
	1963	2 734	1 545	459	88	273	369
	1975	3 565	2 029	571	115	345	505
				Per cent			
The whole country	1955	100	54	11	3	10	22
	1965	100	56	11	3	10	20
	1975	100	57	12	3	10	19
Fredrikstad/ Sarpsborg	1955	100	54	18	3	10	15
	1963	100	57	17	3	10	13
	1973	100	57	16	3	10	14

1) Urban settlements with 1 000 inhabitants or more in 1960 or 1970.

Table 37. Urban expansion on unbuilt land 1955 - 1975[1].

	Period	Land-use after development	Land developed			
			Total	Agriculture	Forest	Other unbuilt land and water
				Hectare		
The whole country	1955 - 1965	Total	17 322	6 294	5 785	5 243
		Residential	10 852	4 078	4 085	2 689
		Other built-up	6 470	2 216	1 700	2 554
	1965 - 1975	Total	21 531	6 842	8 462	6 227
		Residential	12 771	3 989	5 789	2 993
		Other built-up	8 760	2 853	2 673	3 234
Fredrikstad/Sarpsborg	1955 - 1963	Total	598	176	155	267
		Residential	403	105	138	160
		Other built-up	195	71	17	107
	1963 - 1975	Total	879	302	278	299
		Residential	524	125	241	158
		Other built-up	355	177	37	141
				Per cent		
The whole country	1955 - 1965	Total	100	36	33	30
		Residential	100	38	38	25
		Other built-up	100	34	26	39
	1965 - 1975	Total	100	32	39	29
		Residential	100	31	45	23
		Other built-up	100	33	31	37

1) See note 1, table 36.

Table 37 (cont.) Urban expansion on unbuilt land 1955 - 1975[1]).

	Period	Land-use after development	Land developed			
			Total	Agriculture	Forest	Other unbuilt land and water
Fredrikstad/Sarpsborg	1955 - 1963	Total	100	29	26	45
		Residential	100	26	34	40
		Other built-up	100	36	9	55
	1963 - 1975	Total	100	34	32	34
		Residential	100	24	46	30
		Other built-up	100	50	10	40

1) See note 1, table 36.