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EMISSIONS OF NITROGEN OXIDES  
AND HYDROCARBONS IN NORWAY

by

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NORWAY

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1 INTRODUCTION

The present survey of emissions of nitrogen oxides and hydrocarbons to the atmosphere has been prepared for the "Group of Experts on Oxidants and their Precursors in the Atmosphere", OECD. The Expert Group primarily asked for emission data from selected areas, where photochemical smog formation was believed to be a possibility. The emissions should be specified for various categories of sources.

The emissions from combustion of gasoline and fuel oil have been calculated from the sales statistics of the oil companies (1), while information on emissions from industrial processes in most cases has been collected by contacting the industries directly. As many of the available data represented total figures for the country, the emissions for the various categories were first calculated for the whole country; then special calculations were made for the emission from three selected grid squares where smog formation was considered to be a possibility.

In table 1 the total emissions of nitrogen oxides and hydrocarbons for each of the selected grid squares are compared with the total emissions in Norway for 1970. The emissions for the three grid squares add up to respectively 34% and 22% of the total emissions of nitrogen oxides and hydrocarbons for the country. The area of the three grid squares represent only 2.5% of the country, but contains 28% of the Norwegian population.

1970		NO <sub>x</sub> - emission T/year	% of total	Hydrocarbon emission T/year	% of total
Norway, total		99 080		136 935	
(59,9)	Skien/ Porsgrunn	19 930	20	3 850	3
(59,10)	Oslofjord area	5 894	5	10 410	8
(59,5, 10)	Oslo	9 430	10	17 900	13
(Total) Sum		35 254	35	32 160	24

Table 1: Emission per grid square (approx. 3000 km<sup>2</sup>) compared with country total.

The grid square (59,9) has 20% of the total emission of nitrogen oxide in the country. This is due to the large emissions from the nitric acid production at Herøya. These emissions have been considerably reduced. Still one has preferred to make the comparison on the basis of the actual emission figures for 1970, instead of the predicted figures for 1975 and 1980.

The emissions of hydrocarbons and nitrogen oxides in grid square (59,5, 10), the city of Oslo and surroundings, are mainly due to mobile sources. The area contains no major point sources. Similar conditions are found for the two second largest cities in Norway, Bergen (60,5) and Trondheim (63,10). For each of these grid squares emissions from motorised traffic amount to approximately 3% of the total for the country, to which should be added emissions from shipping. Both cities have heavily trafficated harbours, but no dominating point sources.

## 2 EMISSIONS FROM COMBUSTION, COUNTRY TOTALS

The total emissions for the various categories are given in enclosures 1 and 2. Sources of information and methods of calculation are discussed in the following sections.

### 2.1 Mobile sources

#### 2.1.1 Air transport

The emission figures for air transport 1970-1980 are based on information given in (2), a report to the Norwegian Parliament. The estimates for 1975 and 1980 are based on an assumed growth rate in civilian air traffic of 10 - 12% per year, and military air traffic is supposed to represent 50% of the civilian air traffic.

#### 2.1.2 Road transport

The emission calculations are based on the sale of gasoline and diesel fuel. Sales data for 1960, 1965 and 1970 have been obtained from the sales statistics of the oil companies (1). Estimates for 1975 and 1980 are based on predictions worked out by the Norwegian Petroleum Institute. However, the Petroleum Institute has stressed that these prognostic data only represent rough estimates, because of the uncertain energy supply situation and the continuously rising prices of gasoline.

It is not easy to make an accurate evaluation of the magnitude of the emissions from the Norwegian car park, because of problems in specifying an average driving cycle on a country-wide basis. Swedish experts have, however, found that one may use data from the USA, and a Norwegian study (4) shows that it is fully justifiable to use the same emission factors for the Norwegian as for the Swedish car park. The emission factors applied are given in enclosure 3, and represent average emission factors valid for a combination of the traffic and highway driving.

The emissions for 1975 and 1980 are estimated on the basis of two different assumptions: a) No change in present legislation, and b) More strict rules for the emissions from cars. As from 1st January, 1974, the so-called ECE-rules were introduced in Norway, and it is anticipated that these restrictions will be increased by 30% in 1976 and by 75% in 1979. From 1981 it is expected that the American norms of 1975 will be introduced.

However, the ECE-regulations only set limits for the emissions of carbonmonoxide and hydrocarbons. Restrictions on the emissions of nitrogen oxides are not expected until 1979. Swedish measurements (6) indicate that cars which satisfy the ECE-regulations, have an increased emission of nitrogen oxides by 15-20%.

### 2.1.3 Railways

Only a small part of the rolling stock of the NSB (Norwegian State Railways) is diesel powered. The consumption in 1960-65 and 1970 has been obtained from sales statistics (1), and the emissions have been calculated as for diesel engines (see enclosure 3). For 1975 and 1980 no increase of the diesel powered part of the rolling stock has been assumed, and the emissions are assumed to be the same as in 1970.

The Statistical Yearbook of Norway (5) gives the consumption of coal by NSB for the period 1967-70. During this period the consumption has been reduced by more than 90%. The consumption in 1970 corresponds to 5.8 tons NO<sub>2</sub> per year. This amount is considered insignificant and thus omitted.

### 2.1.4 Shipping

The emission calculations are based on the sale of fuel (1). Bunkering in Norway by ships engaged in foreign trade has

been included, even if part of this fuel is used in international waters, in order to compensate for ships from other nations using their own fuel in Norwegian waters. The predictions for 1975 and 1980 has been derived by extrapolation of the tendencies from 1960-70. For ships using light petrol oil the emissions have been calculated as for gasoline engines. For other types of fuel the emission coefficient for diesel engines has been used, see enclosure 3.

## 2.2 Stationary sources

### 2.2.1 Power stations

At present there are no large thermal power stations in Norway, and no decision has been made to construct any such station before 1980.

### 2.2.2 Emissions from industrial oil combustion

The emission calculations are based on information concerning the sale from the oil companies to the industry (1) and private import. The emission factors used (7) are given in enclosure 3. The predictions for 1975 and 1980 are based on information from the Norwegian Petroleum Institute (3). This institute has given estimates for the total expected consumption of light and heavy fuel oils for the country, and using the figures for 1960, 1965 and 1970, one has estimated the part of the expected sale of these oil types which will go to the industry.

### 2.2.3 Emissions from private and commercial heating

The emissions are calculated from the sales statistics of the oil companies (1). In order to obtain the total consumption for the country, the following consumer groups have been added : NSB (railway)-heating, agriculture, house-heating, heating of defence installations, the waste and consumption



by the oil companies themselves. The emission factors used (7) are given in enclosure 3.

The predictions are based on estimates from the Norwegian Petroleum Institute for the expected total sales of fuel, and divided on emission categories by following the same principal as in section 2.2.2. It should be noted that the predicted values given, only represent rough estimates because of the uncertain energy supply situation at present.

### 3 EMISSIONS FROM INDUSTRIAL PROCESSES, COUNTRY TOTALS

#### 3.1 Oil refineries

At present Norway has three refineries with a combined capacity of 8.3 mill. tons per year. In the course of 1975 A/S Rafinor will start production in their new plant at Mongstad with a capacity of 4 mill. tons per year. All information concerning the use of fuel and loss of hydrocarbons at these installations has been obtained from the refineries themselves. The emission factors applied are given in enclosure 3.

#### 3.2 Petrochemical industry

At present there is no petrochemical industry in Norway, but there are definite construction plans to build an ethylene cracker, with Rafnes in Telemark as the probable site. This installation will probably come into operation before 1980, and the expected emissions for this industry have been obtained from Norsk Hydro A/S (8).

#### 3.3 Asphalt production

In Norway 90% of the asphalt production today takes place at Valløy Refineries. According to the company all production takes place in closed installations, and the emissions contain no hydrocarbons. The process gives no emission of nitric oxides. Where the remaining 10% of

the asphalt production takes place, has not been investigated, but possible emissions are considered insignificant.

### 3.4 Nitric acid production

The production of nitric acid in Norway takes place in the plants at Norsk Hydro A/S at Herøya near Porsgrunn and at Glomfjord in Northern Norway. Information concerning the emissions of nitric oxides from the production has been obtained from the company. This also applies to the prognoses for 1975 and 1980.

### 3.5 Other industries

There has been no reason to assume significant emissions of nitric oxides and hydrocarbons from other industries than those mentioned here.

## 4 VARIOUS SOURCES

No data which would make it possible to estimate the emissions from forest fires, painting, service stations and drycleaners are available (see enclosure 1, part III). It is, however, assumed that the magnitude of such emissions is insignificant.

## 5 AREAS WITH A POTENTIAL DANGER FOR PHOTOCHEMICAL SMOG FORMATION

Possibilities for the formation of photochemical smog are present when nitrogen oxides and hydrocarbons are emitted in sufficiently large amounts in the same general area. Under the influence of sun radiation these components will form oxidants as ozon and peroxyacetylnitrate, the main components in photochemical smog. On this basis the area shown in figure 1, page 10, has been selected for a special evaluation of the emissions. It represents a part of Norway with the highest population density and the most extensive industrialisation.

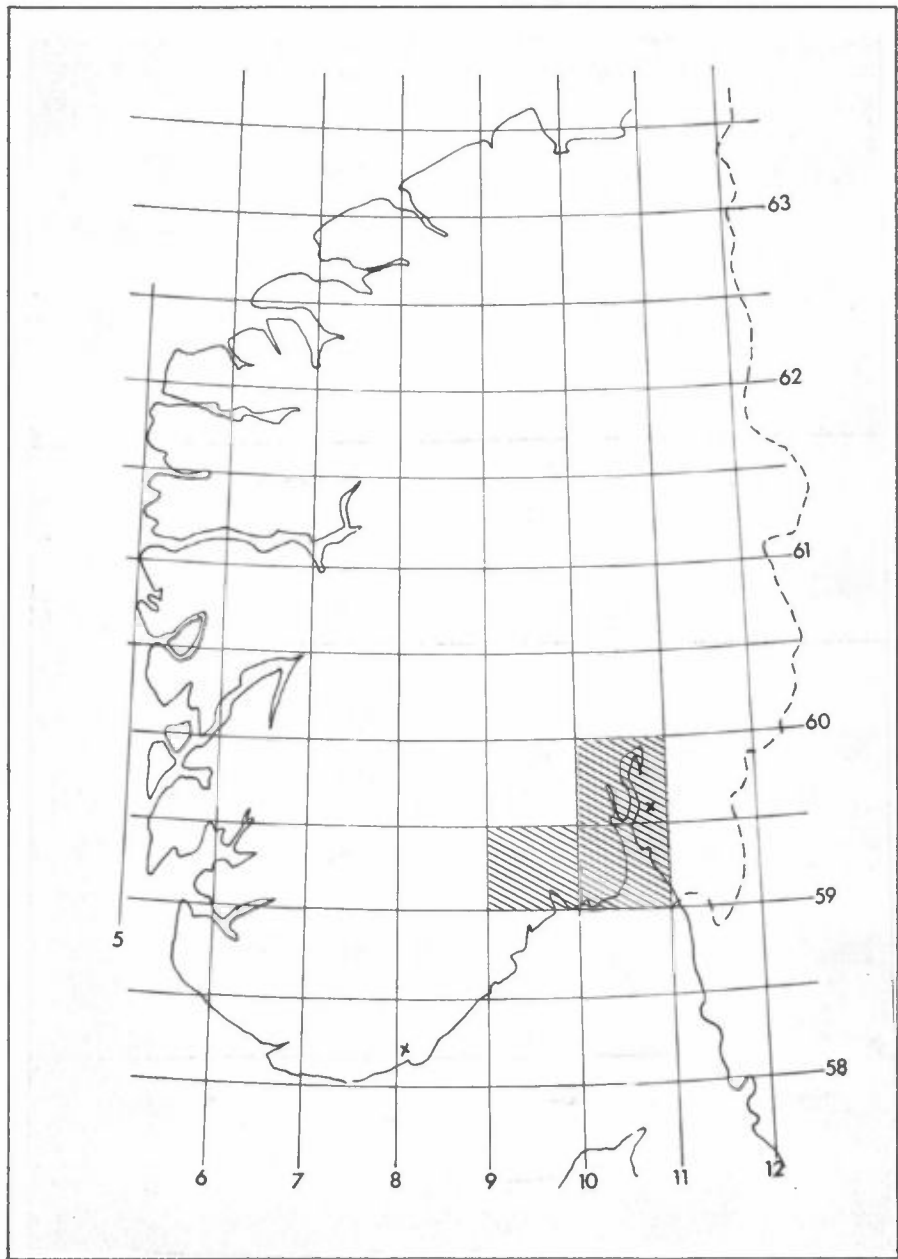


Fig. 1: Emissions for the marked area are given separately in enclosure 4-9.

Grid square (59,9) has a highly developed chemical industry, with some large emissions of nitrogen oxides. In addition petrochemical industries which will emit hydrocarbons, are planned for the same general area.

Grid square (59,10) covers large industrialised areas in the counties Vestfold and Østfold, in addition to the Oslofjord-area which has heavy vehicle traffic. The largest oil refinery in the country is also situated in this grid square. In the Oslo-area, grid square (59,5, 10), one finds the largest car density in the country, and accordingly considerable emissions of nitrogen oxides and hydrocarbons. In addition, Oslo harbour is the most used in the country.

The selected areas surrounding the Oslofjord consist of a mixture of flat and hilly terrain. However, in grid square (59,9) mountains above 800 meters are found in the north-eastern part, also the western parts of grid square (59,10) have hills considerably higher than the rest of the area. Generally, it may, however, be stated that most of the emission sources are situated in relatively open terrain.

The solar radiation conditions in the area are of sufficient intensity for a possible formation of photochemical smog. Measurements of the sunshine hours are, however, only performed at a few places in the country. The measuring points nearest to the area of interest, are at Ås (59.5, 10) and at Kjevik (58,8). In table 2 the relative amount of sunshine hours for the summer months are given for these two measuring points. (Relative number of sunshine hours means the hours with sunshine in per cent of the maximum possible number of sunshine hours.) The figures are mean values for the period 1961 - 1971.

Month	Ås	Kjevik
April	43	44
May	43	44
June	54	58
July	48	51
August	49	50

Table 2: Relative sunshine hours per month (%) for Ås and Kjevik (8).

At both places there is sunshine approximately 50% of the time. The close agreement between the two observation points, in spite of the distance between them, indicates that the measurements should also be fairly representative for the hatched area in figure 1.

## 6 EMISSIONS IN SELECTED GRID SQUARES

The emissions from the various types of sources in the three selected grid squares are given in enclosure 4 - 9. The data used and methods of calculations are discussed in the following section.

### 6.1 Emissions from mobile sources

#### 6.1.1 Air transport

The distribution of the emissions on the grid squares is based on statistics for the number of civilian aircraft departures at the various air fields (9). This distribution is relatively uncertain, because the quantity but not the size of the aircraft has been taken into account. This was, however, the best distribution one could derive from the available data. For the grid squares only emissions from civilian air traffic has been included. The total figures for the country also include emissions from military aircraft.

The emissions of nitrogen oxides are largest during landing, take-off and climb out conditions. The emissions of hydrocarbons are largest during idling and taxing. This should result in a maximum emission load in the vicinity of the airport. The calculated emissions have been added to the grid squares where the respective airports are situated.

#### 6.1.2 Road transport

In order to distribute the emission from road transport it was found convenient to calculate an emission factor per inhabitant, based on the total emissions from the car park divided by the population (5). This factor will of course change from year to year. The emission per grid square is then calculated from the population density given in (10). These figures are for 1970, and a population growth of 1% per annum has been used in the calculations. This is somewhat higher than the average population growth (0.6%, (5)), but these grid squares are influx areas, therefore a population growth of 1% per annum is considered relevant.

#### 6.1.3 Railways

The distribution of the emissions is highly uncertain in this case, but the total emission from the railway traffic is small compared to other sources, which reduces the importance of this uncertainty. The starting point has been the sales statistics of the oil companies for each county, (1). Using railroad maps, the part of the railroads in the county falling within a grid square has been estimated, and the emissions distributed accordingly.

#### 6.1.4 Shipping

Also in this case the distribution of the emissions on the various grid squares becomes highly uncertain, and in this

case it has not been possible to find any material which could be used to estimate the distribution. It has therefore been assumed that the emissions from coast traffic and fisheries are of the same order of magnitude for the squares (59.5,10) and (59,10). On this basis the sale of fuel to these two customers in the counties Oslo, Akershus, Buskerud, Østfold and Vestfold has been added together and the calculated emissions divided equally between the two grid squares. In addition come the emissions from international shipping. In 1970 the calculated emissions from ships moving in international waters but bunkering in Norway, amounted to 38% of the total emissions from shipping in Norway. The total emissions in the grid squares (59,10) and (59.5, 10) have been calculated by adding 40% to the values for coastal traffic and fisheries. For grid square (59,9) 50% of the emissions from coastal traffic and fisheries in the county of Telemark was used with an addition of 40% to obtain the total emission including international shipping.

## 6.2 Emissions from stationary sources

### 6.2.1 Industrial combustion

The association of the Norwegian industries has worked out a statistical survey of oil consumption in the industry, provided on the same grid squares as used in this report. This work was carried out a few years ago in connection with the construction of an emission survey for sulphur dioxide in Norway. However, this survey did not include all industries, therefore the total consumption figures shown by these statistics are somewhat lower than the figures given in the sales statistics (1). In the present report the consumption figures from the sales statistics of the oil companies have been used, and the emissions have been divided on the grid squares proportional to the figures given by the statistics worked out by the association of the industry in Norway.

### 6.2.2 Private and commercial heating

In the same way as for the motorised traffic, an emission factor per inhabitant was calculated for each of the

relevant years, and the emissions per grid square were then calculated from the population figures given in (10).

### 6.2.3 Waste incineration

The distribution is based on direct information concerning the location of the installations and the approximate capacity, however, no information has been available with respect to emission factors and degree of utilisation of these plants. The figures given in the tables, therefore, should be judged as rough estimates only.

## 6.3 Emissions from industrial processes

### 6.3.1 Oil refineries

The emissions from the refineries were distributed according to information from the refineries themselves. Of the three grid squares discussed here, only grid square (59,10) contains a refinery.

### 6.3.2 Petrochemical industry

At present Rafnes is the most probable site for this new industry, and the estimated emissions therefore have been added to grid square (59,9).

### 6.3.3 Asphalt production

The main production takes place at Valløy Refinery in grid square (59,10). It is, however, as mentioned before, claimed that these emissions are free from hydrocarbons.

### 6.3.4 Nitric acid production

The largest production plant for nitric acid is situated in grid square (59,9). The emission figures have been given by the company.



7 SINGLE SOURCES OF MAJOR IMPORTANCE

The statistics worked out by the association of the Norwegian industry gives no information concerning the emissions from single sources. Such data were collected and used as a basis for their statistics, but only total figures for each type of industry within the grid square were published. The available information therefore, is not sufficiently detailed to make possible a listing of all sources representing 10% or more of the emissions in the grid square. However, a look at the emission figures for 1970 shows that the emissions from the nitric acid production at Herøya represent nearly 70% of the total emission in grid square (59,9). For the two other grid squares road transport and shipping are the dominating sources.

8 CONCENTRATIONS MEASURED IN THE AIR

The only place in the selected area where systematic measurements of nitrogen oxides in ambient air have been carried out, is in grid square (59,9). The Control Laboratory for Air Pollution in Telemark has for several years measured the air pollution in this area. The concentration of hydrocarbons has, however, not been measured.

Daily measurements of nitrogen oxides in the autumn of 1970 (11) at several places on the Eidanger peninsula gave the following result:

Of 217 observations, 26 were above  $100 \mu\text{g}/\text{m}^3$  and 1 above  $300 \mu\text{g}/\text{m}^3$ , i.e. approximately 12% of the observations were above  $100 \mu\text{g}/\text{m}^3$ . The yearly average has not been calculated, as short term values are the ones of importance in connection with a possible formation of photochemical smog. In 1970 a limited number of hourly measurements were made in the Skien/Porsgrunn area. A summary of the results shows :

Of 59 observations, 40 were above  $100 \mu\text{g}/\text{m}^3$  and 19 above  $300 \mu\text{g}/\text{m}^3$ .

These values are thus considerably higher than the daily values, however, the hourly measurements were made during particularly unfavourable weather conditions.

The highest concentrations recorded in the district appeared on 11th - 12th January, 1971 at Grava and Løvsjø, where the following 8 hourly averages were observed :

		<u>Grava</u>	<u>Løvsjø</u>
11th January	08-16	865 $\mu\text{g}/\text{m}^3$	1200 $\mu\text{g}/\text{m}^3$
11th January	16-12/1 08	435 $\mu\text{g}/\text{m}^3$	550 $\mu\text{g}/\text{m}^3$

9 LITERATURE

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10 ENCLOSURES

- Enclosure 1 : Total emission of NO<sub>2</sub> in Norway.
- Enclosure 2 : Total emission of hydrocarbons in Norway.
- Enclosure 3 : Survey of emission factors applied.
- Enclosure 4 : Emission of NO<sub>2</sub>, Grid square (59,9)
- Enclosure 5 : Emission of hydrocarbons, Grid square (59,9)
- Enclosure 6 : Emission of NO<sub>2</sub>, Grid square (59,10)
- Enclosure 7 : Emission of hydrocarbons, Grid square (59,10)
- Enclosure 8 : Emission of NO<sub>2</sub>, Grid square (59.5, 10)
- Enclosure 9 : Emission of hydrocarbons, Grid square (59.5, 10)

ENCLOSURE 1 :

Total Emission of NO<sub>2</sub> in Norway



PART I (Contd.)

Give grid parameters or other appropriate geographical reference: Total Norway

State whether for NO<sub>x</sub> or hydrocarbons: NO<sub>2</sub>

Sources	1960		1965		1970	
	Amount of Fuel or Scale of Operation <sup>/</sup>	Emission T / year	Amount of Fuel or Scale of Operation <sup>/</sup>	Emission T / year	Amount of Fuel or Scale of Operation <sup>/</sup>	Emission T / year
II <u>INDUSTRIAL</u>						
Petroleum Refining (including evaporation losses in storage)	-	-	-	380	1 480	
Petrochemical Industry	-	0	0	0	0	
Asphalt manufacturing	-	0	-	0	0	
Nitric Acid Plants	-	21 733		15 357	15 110	
Other Industries*		-		-	-	
III <u>MISCELLANEOUS</u>						
Forest Fires & Open Burning	No data available, but emissions are assumed negligible					
Surface coating; painting etc.						
Service Stations						
Dry Cleaning						
Other*						

<sup>/</sup> Give Units \* Specify as appropriate



Format for Reporting Emissions of Nitrogen

Oxides and Hydrocarbons

PART II

Grid Parameters:           Total, Norway            
 Pollutant:           NO<sub>2</sub>          

Sources	1975			1980		
	Amount of Fuel or Scale of Activity <sup>1</sup>	Emissions (i) Assuming no new abatement technology T/year	Emissions (ii) with controls if appropriate	Amount of Fuel or Scale of Activity <sup>1</sup>	Emissions (i) Assuming no new abatement technology T/year	Emissions (ii) with controls if appropriate
<u>I COMBUSTION</u>						
(i) <u>Mobile</u>						
Air Transport	-	2 300		-	3 880	
Road Transport Gas	460 000m <sup>3</sup>	32 735	37 013	1 700 000m <sup>3</sup>	39 400	48 000
Road Transport Diesel	725 000m <sup>3</sup>	690		880 000m <sup>3</sup>	690	
Railways	30 000m <sup>3</sup>			30 000m <sup>3</sup>		
Internal & Coastal Navigation	-	39 500		-	47 000	
Other*						
(ii) <u>Stationary</u>						
Power Stations		0			0	
Industrial Combustion	2 293 000m <sup>3</sup>	16 510		3 128 000m <sup>3</sup>	22 522	
Domestic & Commercial heating	1 871 000m <sup>3</sup>	2 807		2 328 000m <sup>3</sup>	3 492	
Waste Incineration						
Other *						

PART II (Contd.)

Crid Parameters: Total, Norway  
 Pollutant: NO<sub>2</sub>

Sources	1975		1980	
	Amount of Fuel or Scale of Activity /	Emissions (i) Assuming no new abatement technology T/year	Amount of Fuel or Scale of Activity /	Emissions (i) Assuming no new abatement technology T/year
<u>II INDUSTRIAL</u>				
Petroleum Refining (including evaporation losses in storage)		1 450		2 360
Petrochemical Industry		0		1 460
Asphalt manufacturing		0		0
Nitric Acid Plants		7 160		7 226
Other Industries*		-		-
<u>III MISCELLANEOUS</u>				
Forest Fires & Open Burning	No data. Emissions probably negligible			
Surface coating; painting etc.				
Service Stations				
Dry Cleaning				
Other*				

/ Give units \*Specify as appropriate

ENCLOSURE 2 :

Total Emission of Hydrocarbons in Norway

Format for Reporting Emissions of Nitrogen Oxides and Hydrocarbons

PART I

Give grid parameters or other appropriate geographical reference: Total figures for the whole country

State whether for NO<sub>x</sub> or hydrocarbons: Hydrocarbons

Sources	1960		1965		1970	
	Amount of Fuel or Scale of Operation <sup>†</sup>	Emission T / year	Amount of Fuel or Scale of Operation <sup>†</sup>	Emission T / year	Amount of Fuel or Scale of Operation <sup>†</sup>	Emission T / year
<u>I COMBUSTION</u>						
(i) <u>Mobile</u>						
Air Transport Gasoline	573 322 m <sup>3</sup>	1 600	877 843 m <sup>3</sup>	2 150	1 249 316 m <sup>3</sup>	3 050
Road Transport Diesel	191 609 "	30 406	873 834 "	49 693	565 264 "	72 018
Railways	33 079 "	1 290	23 366 "	911	32 925 "	1 284
Internal & Coastal Navigation	858 068 "	33 466	1 043 845 "	40 715	1 394 880 "	54 406
Other*		-		-		-
(ii) <u>Stationary</u>						
Power Stations		0		0		0
Industrial Combustion	1 366 077 "	464	1 583 064 "	528	2 465 010 "	838
Domestic and Commercial Heating	813 740 "	284	1 139 856 "	400	2 067 673 "	724
Waste Incineration		-		-		300
Other*		-		-		-

<sup>†</sup> Give units

\*Specify as appropriate

PART I (Contd.)

Give grid parameters or other appropriate Total, Norway  
geographical reference:

State whether for NO<sub>x</sub> or hydrocarbons: Hydrocarbons

Sources	1960		1965		1970	
	Amount of Fuel or Scale of Operation <sup>†</sup>	Emission T / year	Amount of Fuel or Scale of Operation <sup>†</sup>	Emission T / year	Amount of Fuel or Scale of Operation <sup>†</sup>	Emission T / year
<u>II INDUSTRIAL</u>						
Petroleum Refining (including evaporation losses in storage)		-		2 910		4 315
Petrochemical Industry		0		0		0
Asphalt manufacturing		Negl.		Negl.		Negl.
Nitric Acid Plants		0		0		0
Other Industries*		-		-		-
<u>III MISCELLANEOUS</u>						
Forest Fires & Open Burning	No data available					
Surface coating; painting etc.						
Service Stations						
Dry Cleaning						
Other*						

<sup>†</sup> Give Units

\* Specify as appropriate

Format for Reporting Emissions of Nitrogen

Oxides and Hydrocarbons

PART II

Grid Parameters:            Total, Norway  
 Pollutant:            Hydrocarbons

Sources	1975			1980		
	Amount of Fuel or Scale of Activity*	Emissions (i) Assuming no new abatement technology T/year	Emissions (ii) with controls if appropriate	Amount of Fuel or Scale of Activity*	Emissions (i) Assuming no new abatement technology T/year	Emissions (ii) with controls if appropriate
<u>I COMBUSTION</u>						
(i) <u>Mobile</u>						
Air Transport Gas	-	4 685	-	-	8 360	-
Road Transport Diesel	1 460 000	86 675	1 700 000	102 320	76 000	
Railways (Diesel engine)	725 000	1 170	30 000	1 170	1 000	
Internal & Coastal Navigation	-	63 700	-	-	74 500	
Other*	-	-	-	-	-	
(ii) <u>Stationary</u>						
Power Stations	-	0	-	-	0	
Industrial Combustion m <sup>3</sup>	2 293 000	803	3 128 000	1 095		
Domestic & Commercial heating m <sup>3</sup>	1 871 000	655	2 328 000	815		
Waste Incineration	-	-	-	-	-	
Other *	-	-	-	-	-	

PART II (Contd.)

Grid Parameters: Total, Norway  
 Pollutant: Hydrocarbons

Sources	1975		1980			
	Amount of Fuel or Scale of Activity†	Emissions (i) Assuming no new abatement technology(T/year)	Emissions (ii) with controls if appropriate	Amount of Fuel or Scale of Activity†	Emissions (i) Assuming no new abatement technology(T/year)	Emissions (ii) with controls if appropriate
<u>II INDUSTRIAL</u>						
Petroleum Refining (including evaporation losses in storage)		3 370			5 430	
Petrochemical Industry		0			482	482
Asphalt manufacturing		Negl.			Negl.	
Nitric Acid Plants		0			0	
Other Industries*		-			-	
<u>III MISCELLANEOUS</u>						
Forest Fires & Open Burning	} No emissions estimated					
Surface coating; painting etc.						
Service Stations						
Dry Cleaning						
Other*						

† Give units \*Specify as appropriate

ENCLOSURE 3 :

Survey of Emission Factors applied



Format for Reporting Emissions of Nitrogen Oxides and Hydrocarbons

PART III

Pollutant: NO2

Sources	Emission Factor assumed for historical data (1960-1970)	Remarks**	Emission Factor assumed for 1975 & 1980 with no new abatement technology	Remarks**	Emission Factor for sources with new controls, if appropriate	Remarks**
<u>I COMBUSTION</u>						
<u>(i) Mobile</u>						
Air Transport Gasoline	11kg NO <sub>2</sub> /m <sup>3</sup> fuel	From lit. (2)	Same	(2)		
Road Transport Diesel	23 " " "	"	"	"	Introducing ECE-tests	
Railways	23 " " "	"	"	"		
Internal & Coastal Navigation	23 " " "	"	"	"		
Other*						
<u>(ii) Stationary</u>						
Power Stations	No power stations		No power stations			
Industrial Combustion	7.2kg NO <sub>2</sub> /m <sup>3</sup> fuel	{7}	7.2kg NO <sub>2</sub> /m <sup>3</sup> fuel	{7}		
Domestic and Commercial Heating	1.5 " " "	{7}	1.5 " " "	"		
Waste Incineration	1.5 " " /waste	(7)				
Other*						

\*\* For remarks give for example (i) Give Units \*Specify as appropriate (ii) Literature reference (iii) whether measured experimentally (iii) any changes in the factor between 1960 & 1970 (iv) any changes in the factor between 1975-80

PART III (Contd.)

Pollutant: NO<sub>2</sub>

Sources	Emission Factor assumed for historical data (1960-1970)	Remarks**	Emission factor assumed for 1975 & 1980 with no new abatement technology	Remarks**	Emission Factor for sources with new controls, if appropriate	Remarks**
II <u>INDUSTRIAL</u> Petroleum Refining (including evaporation losses in storage) Petrochemical Industry Asphalt manufacturing Nitric Acid Plants Other Industries*	Emissions given by company No petrochem industry Emissions given by comp. -		Emissions given by company Expected emission given by comp. Emissions given by comp. -			
III <u>MISCELLANEOUS</u> Forest Fires & Open Burning Surface coating; painting etc. Service Stations Dry Cleaning Other*	No emissions estimated					

\* Give Units  
 \*\*For remarks give for example  
 \*Specify as appropriate  
 (i) literature reference  
 (ii) whether measured experimentally  
 (iii) any changes in the factor between 1960 & 1970  
 (iv) any changes in the factor between 1975 & 1980

Format for Reporting Emissions of Nitrogen Oxides and Hydrocarbons

PART III

Pollutant: Hydrocarbons

Sources	Emission Factor assumed for historical data (1960-1970)	Remarks**	Emission Factor assumed for 1975 & 1980 with no new abatement technology	Remarks**	Emission Factor for sources with new controls, if appropriate	Remarks**
<u>I COMBUSTION</u>						
<u>(i) Mobile</u>						
Air Transport	Gas. engine 40kg CH <sub>4</sub> /m <sup>3</sup> fuel		Same			
Road Transport	" " " "	From lit. (2)	"			
Railways	" " " "	"	"			
Internal & Coastal Navigation	" " " "	"	"			
Other*	39	"	"			
<u>(ii) Stationary</u>						
Power Stations						
Industrial Combustion	0.35	" (7)	"			
Domestic and Commercial Heating	0.35	" (7)	"			
Waste Incineration	0.75/T waste	" (7)	"			
Other*						

\* Give Units  
 \*\* For remarks give for example (i) Literature reference (ii) whether measured experimentally (iii) any changes in the factor between 1960 & 1970 (iv) any changes in the factor between 1975-80

PART III (Contd.)

Pollutant: Hydrocarbons

Sources	Emission Factor/ assumed for historical data (1960-1970)	Remarks**	Emission factor/ assumed for 1975 & 1980 with no new abatement technology	Remarks**	Emission Factor/ for sources with new controls, if appropriate	Remarks**
II <u>INDUSTRIAL</u> Petroleum Refining (including evaporation losses in storage) Petrochemical Industry Asphalt manufacturing Nitric Acid Plants Other Industries*	Data given by company - Data given by company -		Estimates given by company Expected emissions given by company Estimates given by company			
III <u>MISCELLANEOUS</u> Forest Fires & Open Burning Surface coating; painting etc. Service Stations Dry Cleaning Other*	No emission factors assumed					

\* Give Units

\*\*For remarks give for example

\*Specify as appropriate

(i) literature reference

(ii) whether measured experimentally

(iii) any changes in the factor between 1960 & 1970

(iv) any changes in the factor between 1975 & 1980

ENCLOSURE 4 :

Emission of NO<sub>2</sub>, Grid Square (59,9)

Format for Reporting Emissions of  
Nitrogen Oxides and Hydrocarbons

PART I

Give grid parameters or other appropriate geographical reference: (59,9) (Skien/Porsgrunn)

State whether for NO<sub>x</sub> or hydrocarbons: NO<sub>2</sub>

Sources	1960		1965		1970	
	Amount of Fuel or Scale of Operation <sup>/</sup>	Emission T / year	Amount of Fuel or Scale of Operation <sup>/</sup>	Emission T / year	Amount of Fuel or Scale of Operation <sup>/</sup>	Emission T / year
<u>I COMBUSTION</u>						
(i) <u>Mobile</u>						
Air Transport		-		-		-
Road Transport		312		536		792
Railways		7		9		10
Internal & Coastal Navigation		118		245		872
Other*						
(ii) <u>Stationary</u>						
Power Stations	-	2 171	-	2 516	-	3 918
Industrial Combustion m <sup>3</sup>		35		50		92
Domestic and Commercial Heating						
Waste Incineration						8
Other*	-		-		-	

<sup>/</sup> Give units

\*Specify as appropriate

PART I (Contd.)

Give grid parameters or other appropriate geographical reference: (59,9)

State whether for NO<sub>x</sub> or hydrocarbons: NO<sub>2</sub>

Sources	1960		1965		1970	
	Amount of Fuel or Scale of Operation†	Emission T/year	Amount of Fuel or Scale of Operation†	Emission T / year	Amount of Fuel or Scale of Operation†	Emission T / year
<p>II <u>INDUSTRIAL</u></p> <p>Petroleum Refining (including evaporation losses in storage)</p> <p>Petrochemical Industry</p> <p>Asphalt manufacturing</p> <p>Nitric Acid Plants</p> <p>Other Industries*</p>		21 535		14 235		14 235
<p>III <u>MISCELLANEOUS</u></p> <p>Forest Fires &amp; Open Burning</p> <p>Surface coating; painting etc.</p> <p>Service Stations</p> <p>Dry Cleaning</p> <p>Other*</p>	No data, but the emissions are probably negligible					

† Give Units \* Specify as appropriate

Format for Reporting Emissions of Nitrogen

Oxides and Hydrocarbons

PART II

Grid Parameters: (59,9)

Pollutant: NO<sub>2</sub>

Sources	1975			1980		
	Amount of Fuel or Scale of Activity	Emissions (i) Assuming no new abatement technology (T/year)	Emissions (ii) with controls if appropriate	Amount of Fuel or Scale of Activity	Emissions (i) Assuming no new abatement technology (T/year)	Emissions (ii) with controls if appropriate
<u>I COMBUSTION</u>						
(i) <u>Mobile</u>						
Air Transport						
Road Transport		988			1 202	
Railways		10			10	
Internal & Coastal Navigation		1 109			1 540	
Other*						
(ii) <u>Stationary</u>						
Power Stations						
Industrial Combustion		3 632			4 955	
Domestic & Commercial heating		84			106	
Waste Incineration						
Other *						



PART II (Contd.)

Grid Parameters: (59,9)

Pollutant: NO<sub>2</sub>

Sources	1975		1980	
	Amount of Fuel or Scale of Activity*	Emissions (i) Assuming no new abatement technology (T/year)	Amount of Fuel or Scale of Activity*	Emissions (i) Assuming no new abatement technology (T/year)
<p><u>II INDUSTRIAL</u></p> <p>Petroleum Refining (including evaporation losses in storage)</p> <p>Petrochemical Industry</p> <p>Asphalt manufacturing</p> <p>Nitric Acid Plants</p> <p>Other Industries*</p>				
<p><u>III MISCELLANEOUS</u></p> <p>Forest Fires &amp; Open Burning</p> <p>Surface coating; painting etc.</p> <p>Service Stations</p> <p>Dry Cleaning</p> <p>Other*</p>	Negligible	5 840	5 840	1 460
				1 460

\* Give units \*Specify as appropriate

ENCLOSURE 5 :

Emission of Hydrocarbons, Grid Square (59,9)

Format for Reporting Emissions of  
Nitrogen Oxides and Hydrocarbons

PART I

Give grid parameters or other appropriate geographical reference: (59,9) (Skien/Porsgrunn)

State whether for NO<sub>x</sub> or hydrocarbons: Hydrocarbons

Sources	1960		1965		1970	
	Amount of Fuel or Scale of Operation <sup>/</sup>	Emission T / year	Amount of Fuel or Scale of Operation <sup>/</sup>	Emission T / year	Amount of Fuel or Scale of Operation <sup>/</sup>	Emission T / year
<u>I COMBUSTION</u>						
(i) <u>Mobile</u>						
Air Transport						
Road Transport		885		1 454		2 135
Railways		12		16		16
Internal & Coastal Navigation		200		426		1 491
Other*		-		-		-
(ii) <u>Stationary</u>						
Power Stations		102		116		184
Industrial Combustion		8		12		22
Domestic and Commercial Heating		-		-		4
Waste Incineration						
Other**						

<sup>/</sup> Give units

\*Specify as appropriate

PART I (Contd.)

Give grid parameters or other appropriate geographical reference: (59,9)

State whether for NO<sub>x</sub> or hydrocarbons: Hydrocarbons

Sources	1960		1965		1970	
	Amount of Fuel or Scale of Operation <sup>†</sup>	Emission T / year	Amount of Fuel or Scale of Operation <sup>†</sup>	Emission T / year	Amount of Fuel or Scale of Operation <sup>†</sup>	Emission T / year
II <u>INDUSTRIAL</u>						
Petroleum Refining (including evaporation losses in storage)		-		-		-
Petrochemical Industry		-		-		-
Asphalt manufacturing		-		-		-
Nitric Acid Plants		-		-		-
Other Industries*		-		-		-
III <u>MISCELLANEOUS</u>						
Forest Fires & Open Burning						
Surface coating; painting etc.	negligible					
Service Stations						
Dry Cleaning						
Other*						

<sup>†</sup> Give Units \* Specify as appropriate

Format for Reporting Emissions of Nitrogen

Oxides and Hydrocarbons

PART II

Grid Parameters: (59,9)

Pollutant: Hydrocarbons

Sources	1975		1980		
	Amount of Fuel or Scale of Activity	Emissions (i) Assuming no new abatement technology (T/year)	Emissions (ii) with controls if appropriate	Emissions (i) Assuming no new abatement technology (T/year)	Emissions (ii) with controls if appropriate
<u>I COMBUSTION</u>					
(i) <u>Mobile</u>					
Air Transport		-		-	
Road Transport		2 616		3 126	
Railways		16		16	
Internal & Coastal Navigation		2 030		2 618	
Other*					
(ii) <u>Stationary</u>					
Power Stations		-		-	
Industrial Combustion		177		241	
Domestic & Commercial heating		19		25	
Waste Incineration					
Other *					

PART II (Contd.)

Grid Parameters: \_\_\_\_\_ (59,9)

Pollutant: \_\_\_\_\_ Hydrocarbons

Sources	1975		1980	
	Amount of Fuel or Scale of Activity <sup>†</sup>	Emissions (i) Assuming no new abatement technology (T/year)	Amount of Fuel or Scale of Activity <sup>†</sup>	Emissions (i) Assuming no new abatement technology (T/year)
<p><u>II INDUSTRIAL</u></p> <p>Petroleum Refining (including evaporation losses in storage)</p> <p>Petrochemical Industry</p> <p>Asphalt manufacturing</p> <p>Nitric Acid Plants</p> <p>Other Industries*</p>	-	-	-	-
<p><u>III MISCELLANEOUS</u></p> <p>Forest Fires &amp; Open Burning</p> <p>Surface coating; painting etc.</p> <p>Service Stations</p> <p>Dry Cleaning</p> <p>Other*</p>	Negligible	-	482	482

<sup>†</sup> Give units \*Specify as appropriate

ENCLOSURE 6 :

Emission of NO<sub>2</sub>, Grid Square (59,10)

Format for Reporting Emissions of Nitrogen Oxides and Hydrocarbons

PART I

Give grid parameters or other appropriate geographical reference: (59.0.10)

State whether for NO<sub>x</sub> or hydrocarbons: NO<sub>2</sub>

Sources	1960		1965		1970	
	Amount of Fuel or Scale of Operation <sup>†</sup>	Emission T/year	Amount of Fuel or Scale of Operation <sup>†</sup>	Emission T/year	Amount of Fuel or Scale of Operation <sup>†</sup>	Emission T/year
<u>I COMBUSTION</u>						
(i) <u>Mobile</u>						
Air Transport		30		35		80
Road Transport		630		1 087		1 608
Railways		20		9		11
Internal & Coastal Navigation		630		966		1 750
Other*						
(ii) <u>Stationary</u>						
Power Stations						
Industrial Combustion	135 242	977	156 723	1 132	244 036	1 763
Domestic and Commercial Heating		72		102		186
Waste Incineration						16
Other*						

<sup>†</sup> Give units

\*Specify as appropriate



PART I (Contd.)

Give grid parameters or other appropriate geographical reference: (59.0, 10)

State whether for NO<sub>x</sub> or hydrocarbons: NO<sub>2</sub>

Sources	1960		1965		1970	
	Amount of Fuel or Scale of Operation†	Emission T/year	Amount of Fuel or Scale of Operation†	Emission T/year	Amount of Fuel or Scale of Operation†	Emission T/year
II <u>INDUSTRIAL</u>						
Petroleum Refining (including evaporation losses in storage)				380		480
Petrochemical Industry		o		o		o
Asphalt manufacturing		Negl.		Negl.		Negl.
Nitric Acid Plants		o		o		o
Other Industries*		-		-		-
III <u>MISCELLANEOUS</u>						
Forest Fires & Open Burning						
Surface coating; painting etc.	No emissions estimated					
Service Stations						
Dry Cleaning						
Other*						

† Give Units \* Specify as appropriate

Format for Reporting Emissions of Nitrogen  
Oxides and Hydrocarbons

PART II

Grid Parameters: (59.0, 10)  
Pollutant: NO2

Sources	1975			1980		
	Amount of Fuel or Scale of Activity*	Emissions (i) Assuming no new abatement technology(T/year)	Emissions (ii) with controls if appropriate	Amount of Fuel or Scale of Activity*	Emissions (i) Assuming no new abatement technology(T/year)	Emissions (ii) with controls if appropriate
<u>I COMBUSTION</u>						
(i) <u>Mobile</u>						
Air Transport		150			300	
Road Transport T	-	2 006		-	2 440	
Railways		10			10	
Internal & Coastal Navigation		2 380			2 800	
Other*		-			-	
(ii) <u>Stationary</u>						
Power Stations		0			0	
Industrial Combustion	227 000	1 634		309 672	2 230	
Domestic & Commercial heating		171			216	
Waste Incineration		-			-	
Other *		-			-	

PART II (Contd.)

Grid Parameters: (59.0, 10)

Pollutant: NO<sub>2</sub>

Sources	1975		1980	
	Amount of Fuel or Scale of Activity	Emissions (i) Assuming no new abatement technology (T/year)	Amount of Fuel or Scale of Activity	Emissions (i) Assuming no new abatement technology (T/year)
<p><u>II INDUSTRIAL</u></p> <p>Petroleum Refining (including evaporation losses in storage)</p> <p>Petrochemical Industry</p> <p>Asphalt manufacturing</p> <p>Nitric Acid Plants</p> <p>Other Industries*</p>		450		420
<p><u>III MISCELLANEOUS</u></p> <p>Forest Fires &amp; Open Burning</p> <p>Surface coating; painting etc.</p> <p>Service Stations</p> <p>Dry Cleaning</p> <p>Other*</p>	No data, but emissions are assumed negligible	0		0
		0		0
		Negl.		Negl.

\* Give units / Specify as appropriate

ENCLOSURE 7 :

Emission of Hydrocarbons, Grid Square (59,10)

Format for Reporting Emissions of  
Nitrogen Oxides and Hydrocarbons

PART I

Give grid parameters or other appropriate geographical reference: (59.0.10) (Vestfold/Østfold)

State whether for NO<sub>x</sub> or hydrocarbons: Hydrocarbons

Sources	1960		1965		1970	
	Amount of Fuel or Scale of Operation <sup>†</sup>	Emission T/year	Amount of Fuel or Scale of Operation <sup>†</sup>	Emission T/year	Amount of Fuel or Scale of Operation <sup>†</sup>	Emission T/year
<u>I COMBUSTION</u>						
(i) <u>Mobile</u>						
Air Transport		50		60		140
Road Transport		1 796		2 951		4 334
Railways		34		16		18
Internal & Coastal Navigation		1 064		1 694		2 968
Other*						
(ii) <u>Stationary</u>						
Power Stations		0		0		0
Industrial Combustion	135 242		156 723		244 036	83
Domestic and Commercial Heating		46		52		44
Waste Incineration		17		24		8
Other*		-		-		-
		-		-		-

<sup>†</sup> Give units

\*Specify as appropriate

PART I (Contd.)

Give grid parameters or other appropriate geographical reference: (59.0, 10)

State whether for NO<sub>x</sub> or hydrocarbons: Hydrocarbons

Sources	1960		1965		1970	
	Amount of Fuel or Scale of Operation†	Emission T/year	Amount of Fuel or Scale of Operation†	Emission T/year	Amount of Fuel or Scale of Operation†	Emission T/year
<u>II INDUSTRIAL</u>						
Petroleum Refining (including evaporation losses in storage)				2 910		2 815
Petrochemical Industry		0		0		0
Asphalt manufacturing		Negl.		Negl.		Negl.
Nitric Acid Plants		0		0		0
Other Industries*		-		-		-
<u>III MISCELLANEOUS</u>						
Forest Fires & Open Burning	No emissions estimated					
Surface coating; painting etc.						
Service Stations						
Dry Cleaning						
Other*						

† Give Units \* Specify as appropriate

Format for Reporting Emissions of Nitrogen

Oxides and Hydrocarbons

PART II

Grid Parameters: \_\_\_\_\_ (59.0, 10)

Pollutant: \_\_\_\_\_ Hydrocarbons

Sources	1975		1980		
	Amount of Fuel or Scale of Activity	Emissions (i) Assuming no new abatement technology (T/year)	Emissions (ii) with controls if appropriate	Emissions (i) Assuming no new abatement technology (T/year)	Emissions (ii) with controls if appropriate
<u>I COMBUSTION</u>					
(i) <u>Mobile</u>					
Air Transport		275		630	
Road Transport		5 308		6 345	
Railways		18		18	
Internal & Coastal Navigation		3 710		4 900	
Other*		-		-	
(ii) <u>Stationary</u>					
Power Stations		0		0	
Industrial Combustion	227 000m <sup>3</sup>	80		108	
Domestic & Commercial heating		39		51	
Waste Incineration					
Other *		-		-	
	309 000				

PART II (Contd.)

Grid Parameters: (59.0, 10)

Pollutant: Hydrocarbons

Sources	1975		1980			
	Amount of Fuel or Scale of Activity	Emissions (i) Assuming no new abatement technology	Emissions (ii) with controls if appropriate	Amount of Fuel or Scale of Activity	Emissions (i) Assuming no new abatement technology	Emissions (ii) with controls if appropriate
<p><u>II INDUSTRIAL</u></p> <p>Petroleum Refining (including evaporation losses in storage)</p> <p>Petrochemical Industry</p> <p>Asphalt manufacturing</p> <p>Nitric Acid Plants</p> <p>Other Industries*</p>		1 870			1 880	
<p><u>III MISCELLANEOUS</u></p> <p>Forest Fires &amp; Open Burning</p> <p>Surface coating; painting etc.</p> <p>Service Stations</p> <p>Dry Cleaning</p> <p>Other*</p>	No emissions estimated				0 Negl. 0 -	

\* Give units \*Specify as appropriate



ENCLOSURE 8 :

Emission of NO<sub>2</sub>, Grid Square (59.5, 10)

Format for Reporting Emissions of  
Nitrogen Oxides and Hydrocarbons

PART I

Give grid parameters or other appropriate geographical reference: (59.5, 10) Oslo

State whether for NO<sub>x</sub> or hydrocarbons: NO<sub>2</sub>

Sources	1960		1965		1970	
	Amount of Fuel or Scale of Operation <sup>†</sup>	Emission T/year	Amount of Fuel or Scale of Operation <sup>†</sup>	Emission T/year	Amount of Fuel or Scale of Operation <sup>†</sup>	Emission T/year
<u>I COMBUSTION</u>						
(i) <u>Mobile</u>						
Air Transport		150		150		210
Road Transport		2 052		3 542		5 238
Railways		143		135		126
Internal & Coastal Navigation		630		966		1 750
Other*		-		-		-
(ii) <u>Stationary</u>						
Power Stations		0		0		0
Industrial Combustion	135 242 m <sup>3</sup>	977	156 723 m <sup>3</sup>	1 132	244 036 m <sup>3</sup>	1 763
Domestic and Commercial Heating		72		102		186
Waste Incineration		-		-		160
Other*		-		-		-

<sup>†</sup> Give units

\*Specify as appropriate

PART I (Contd.)

Give grid parameters or other appropriate geographical reference: (59.5, 10)

State whether for NO<sub>x</sub> or hydrocarbons: NO<sub>2</sub>

Sources	1960		1965		1970	
	Amount of Fuel or Scale of Operation <sup>†</sup>	Emission T / year	Amount of Fuel or Scale of Operation <sup>†</sup>	Emission T / year	Amount of Fuel or Scale of Operation <sup>†</sup>	Emission T / year
II <u>INDUSTRIAL</u>						
Petroleum Refining (including evaporation losses in storage)		0		0		0
Petrochemical Industry		0		0		0
Asphalt manufacturing		0		0		0
Nitric Acid Plants		0		0		0
Other Industries*		-		-		-
III <u>MISCELLANEOUS</u>						
Forest Fires & Open Burning	No information available.					
Surface coating; painting etc.	Emissions assumed negligible					
Service Stations						
Dry Cleaning						
Other*						

<sup>†</sup> Give Units \* Specify as appropriate

Format for Reporting Emissions of Nitrogen

Oxides and Hydrocarbons

PART II

Grid Parameters: (59.5, 10)

Pollutant: NO<sub>2</sub>

Sources	1975			1980		
	Amount of Fuel or Scale of Activity*	Emissions (i) Assuming no new abatement technology (T/year)	Emissions (ii) with controls if appropriate	Amount of Fuel or Scale of Activity*	Emissions (i) Assuming no new abatement technology (T/year)	Emissions (ii) with controls if appropriate
<u>I COMBUSTION</u>						
(i) <u>Mobile</u>						
Air Transport		340			600	
Road Transport		6 536			7 951	
Railways		115			115	
Internal & Coastal Navigation		2 380			2 800	
Other*		-			-	
(ii) <u>Stationary</u>						
Power Stations		0			0	
Industrial Combustion	227 000	1 634		309 672	2 230	
Domestic & Commercial heating	-	171		-	216	
Waste Incineration		-			-	
Other *		-			-	

PART II (Contd.)

Grid Parameters: (59.5, 10)

Pollutant: NO<sub>2</sub>

Sources	1975		1980	
	Amount of Fuel or Scale of Activity /	Emissions (i) Assuming no new abatement technology (T/year)	Amount of Fuel or Scale of Activity /	Emissions (i) Assuming no new abatement technology (T/year)
<p>II <u>INDUSTRIAL</u></p> <p>Petroleum Refining (including evaporation losses in storage)</p> <p>Petrochemical Industry</p> <p>Asphalt manufacturing</p> <p>Nitric Acid Plants</p> <p>Other Industries*</p>	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0
<p>III <u>MISCELLANEOUS</u></p> <p>Forest Fires &amp; Open Burning</p> <p>Surface coating; painting etc.</p> <p>Service Stations</p> <p>Dry Cleaning</p> <p>Other*</p>	No estimates made			

/ Give units \*Specify as appropriate

ENCLOSURE 9 :

Emission of Hydrocarbons, Grid Square (59.5, 10)

Format for Reporting Emissions of  
Nitrogen Oxides and Hydrocarbons

PART I

Give grid parameters or other appropriate geographical reference: (59.5, 10) Oslo-området

State whether for NO<sub>x</sub> or hydrocarbons: Hydrocarbons

Sources	1960		1965		1970	
	Amount of Fuel or Scale of Operation <sup>†</sup>	Emission T / year	Amount of Fuel or Scale of Operation <sup>†</sup>	Emission T / year	Amount of Fuel or Scale of Operation <sup>†</sup>	Emission T / year
<u>I COMBUSTION</u>						
<u>(i) Mobile</u>						
Air Transport		270		270		380
Road Transport		5 852		9 615		14 119
Railways		248		234		220
Internal & Coastal Navigation		1 064		1 694		2 968
Other*		-		-		-
<u>(ii) Stationary</u>						
Power Stations		0		0		0
Industrial Combustion	135 242 m <sup>3</sup>	50	156 723 m <sup>3</sup>	52	244 036 m <sup>3</sup>	85
Domestic and Commercial Heating	-	17	-	24	-	44
Waste Incineration		-		-		80
Other*		-		-		-

<sup>†</sup> Give units

\*Specify as appropriate

PART I (Contd.)

Give grid parameters or other appropriate geographical reference: (59.5. 10)

State whether for NO<sub>x</sub> or hydrocarbons: Hydrocarbons

Sources	1960		1965		1970	
	Amount of Fuel or Scale of Operation <sup>†</sup>	Emission T / year	Amount of Fuel or Scale of Operation <sup>†</sup>	Emission T / year	Amount of Fuel or Scale of Operation <sup>†</sup>	Emission T / year
II <u>INDUSTRIAL</u>						
Petroleum Refining (including evaporation losses in storage)		0		0		0
Petrochemical Industry		0		0		0
Asphalt manufacturing		0		0		0
Nitric Acid Plants		0		0		0
Other Industries*		-		-		-
III <u>MISCELLANEOUS</u>						
Forest Fires & Open Burning	No estimates made					
Surface coating; painting etc.						
Service Stations						
Dry Cleaning						
Other*						

<sup>†</sup> Give Units \* Specify as appropriate



Format for Reporting Emissions of Nitrogen

Oxides and Hydrocarbons

PART II

Grid Parameters: (59.5, 10)  
 Pollutant: Hydrocarbons

Sources	1975		1980	
	Amount of Fuel or Scale of Activity	Emissions (i) Assuming no new abatement technology (T/year)	Emissions (ii) with controls if appropriate	Emissions (i) Assuming no new abatement technology (T/year)
<u>I COMBUSTION</u>				
(i) <u>Mobile</u>				
Air Transport		623		1 205
Road Transport		17 296		20 672
Railways		200		200
Internal & Coastal Navigation		3 710		4 900
Other*		-		-
(ii) <u>Stationary</u>				
Power Stations		0		0
Industrial Combustion	227 000 m <sup>3</sup>	80		108
Domestic & Commercial heating	-	39		52
Waste Incineration				
Other *		-		-
			Amount of Fuel or Scale of Activity	
			309 672 m <sup>3</sup>	

PART II (Contd.)

Grid Parameters: (59.5, 10)

Pollutant: Hydrocarbons

Sources	1975		1980	
	Amount of Fuel or Scale of Activity	Emissions (i) Assuming no new abatement technology (T/year)	Amount of Fuel or Scale of Activity	Emissions (i) Assuming no new abatement technology (T/year)
<p><u>II INDUSTRIAL</u></p> <p>Petroleum Refining (including evaporation losses in storage)</p> <p>Petrochemical Industry</p> <p>Asphalt manufacturing</p> <p>Nitric Acid Plants</p> <p>Other Industries*</p>	0	0	0	0
<p><u>III MISCELLANEOUS</u></p> <p>Forest Fires &amp; Open Burning</p> <p>Surface coating; painting etc.</p> <p>Service Stations</p> <p>Dry Cleaning</p> <p>Other*</p>	No estimates made	0	0	0

\* Give units \*Specify as appropriate