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FOREWORD

The European Parliament, elected by universal suffrage for the first time in 1979, is just over one year into its third term. Since 1979 Parliament has been a prime mover of the democratisation of the European Community (EC). Indeed, this latest study in the European Parliament's Research and Documentation series is published just months before the Community embarks on another Intergovernmental Conference to consider not just economic and monetary union but also European political union.

The reform of the Community is not an end in itself. It is by necessity a central preoccupation of the European Parliament precisely because we recognise that it is essential for the Community to have the capability to tackle the many common problems facing European nations. Accordingly, the building of Europe's political institutions must be matched by real progress on the issues that affect Europe's citizens. Here environmental policy is central. EC environmental policy has a crucial role to play in improving Europeans' quality of life.

It is now beyond doubt that environmental questions are a major policy concern of the EC. This is right and proper; as it is often said, there has for long in Europe been an open market in pollution. Europe's common environmental problems can only be addressed effectively in common, rather than by nation states acting individually and separately.

This Research Paper is intended to provide a catalogue of data relating to the European environment. It brings together in one place a host of information which will be valuable to all those interested in the actual state of the environment.

A great deal needs to be done to resolve Europe's diverse environmental problems. Only now is the Community starting to look, for example, at the question of the urban environment. Moreover, recent months have seen the Community and its Member States embark on a major examination of the kind of policy mechanisms which could be developed to encourage greater care for the environment. We must also, of course, now turn our attention to Eastern Europe.

The importance of environmental policy can only increase still further during the 1990s. This Research Paper is a most valuable contribution to our understanding of the problems which we must address.

Ken Collins MEP
President, Committee on Environment, Public Health
and Consumer Protection.

Contents

Introduction

The transfrontier nature of environmental dangers and problems constantly draws attention to the limitations of national action and the need for a European or international environmental policy, in particular as many environmental problems affect the whole world (e.g. greenhouse effect, depletion of the ozone layer, etc.). It is essential to a more international environmental policy to have a collection of data on the environmental situation in the individual states.

It is difficult to put together an analysis of the current environmental situation in the Community. There is only limited scope for drawing final conclusions for the Community from national reports as analysis and comparison between states is made more difficult by the lack of data, the gaps in the data series and the frequently differing methods of data collection in individual Member States. As yet Community surveys relate only to specific sectors.

In addition, within the Community's boundaries a wide range of environmental conditions prevails, making it difficult to generalize about the environmental situation in regions of the Community. It is necessary merely to point to the range of landscape types (wooded hills, sand dunes etc.) and the climatic differences. Nevertheless such an attempt was made with this presentation of the current environmental situation in order to enable those responsible in the political arena and the general public to gain some insight into the conditions in various environmental sectors and thus to create an awareness of the variety of environmental problems which are characteristic of the Community's regions.

This document from the Social Affairs and Environmental Protection section of the European Parliament's Directorate-General for Research (IV) presents a comparison of selected environmental data for the Community's Member States. Where possible data from the USA and Japan has also been added and, in view of the unification of both German states, also such data from the GDR as was available to the compiler.

The project is in the nature of an inventory and the aim was not to draw up recommendations for action but, rather, to try to describe the current environmental situation in the Community. It is intended as an aid to the operation of an effective Community environmental policy, in line with the EC's need to act on environmental matters, in an area of policy in which the European Parliament has often demonstrated its expertise and adopted a pioneering role.

The inventory deals with specific environmental elements, water, air, and waste, and also covers the situation of forests and some data on the energy sector. The first chapter includes, for information, general data on population, country size and gross domestic product.

1. General data

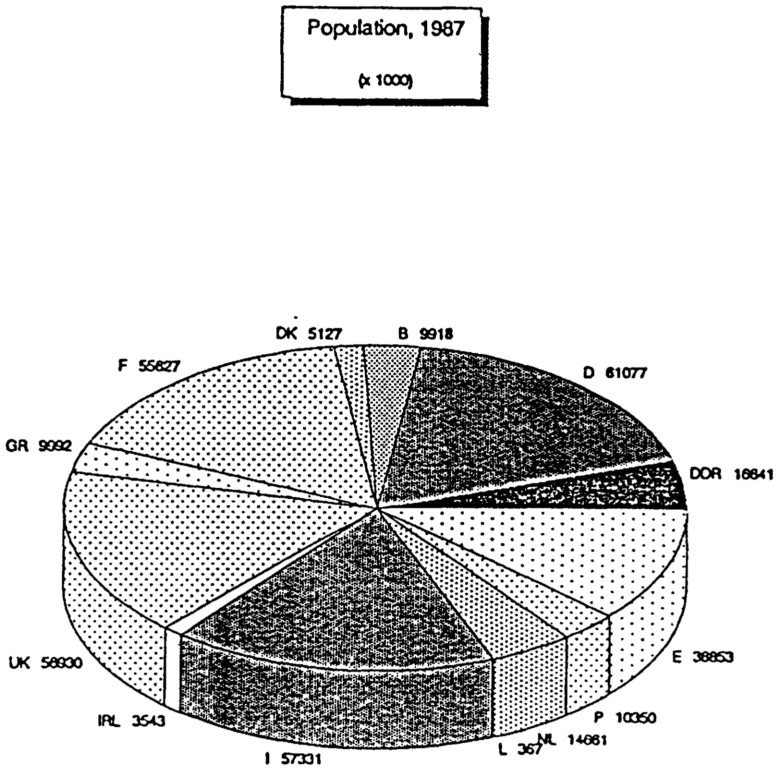
1.1 Actual population and population trends in the Community

The total population and population density are key factors with regard to the consumption of resources and the effect of human activities.

In 1985 world population was estimated at 4.84 billion people. By comparison with 1950 (2.5 bn) the world's population has almost doubled. In 1990 a further increase to 6.12 bn is forecast and an increase to 6.99 bn people is estimated by the year 2000.

According to information available, 323 754 000 people lived in the European Community in 1987 (see figure 1).

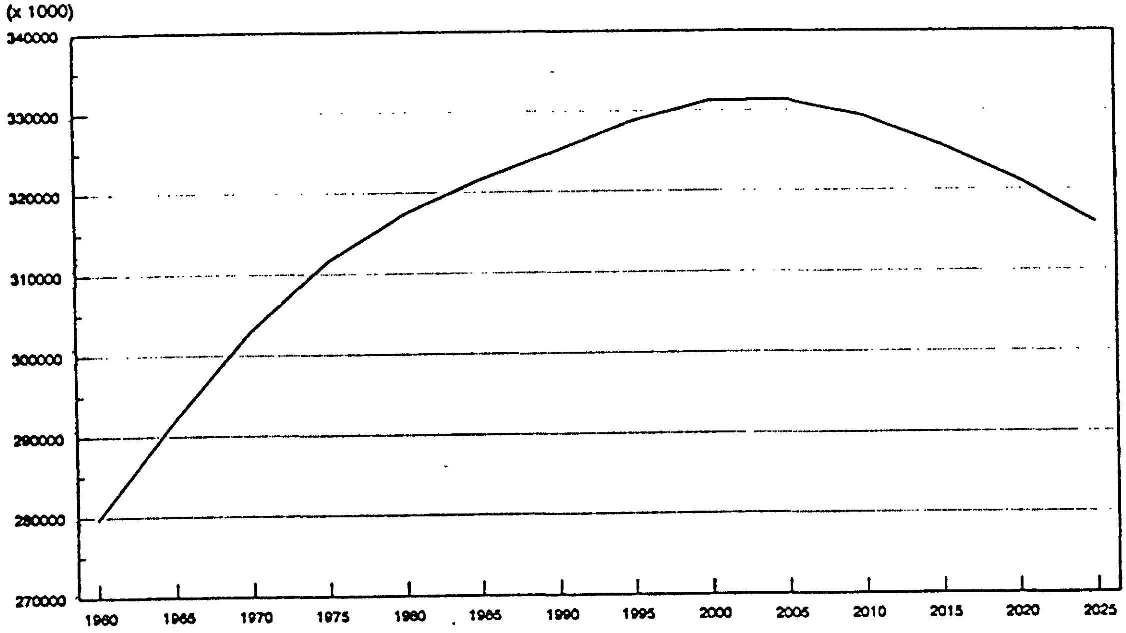
Figure 1: Community population in 1987



Source: EUROSTAT
for the GDR: DG IV (EP)

By comparison with world population growth (from 1980 to 1985 the growth rate for the developed countries was 0.6% and for the developing countries about 2%) population growth in the European Community is small and the rate of increase of population growth fell for several years. Between 1980 and 1985 the rate of increase in the Community was 0.24% per year, but the Community's population has increased by more than 40 m people (see Figure 2) since 1969.

Figure 2: POPULATION TRENDS FOR THE EC 1960-2025

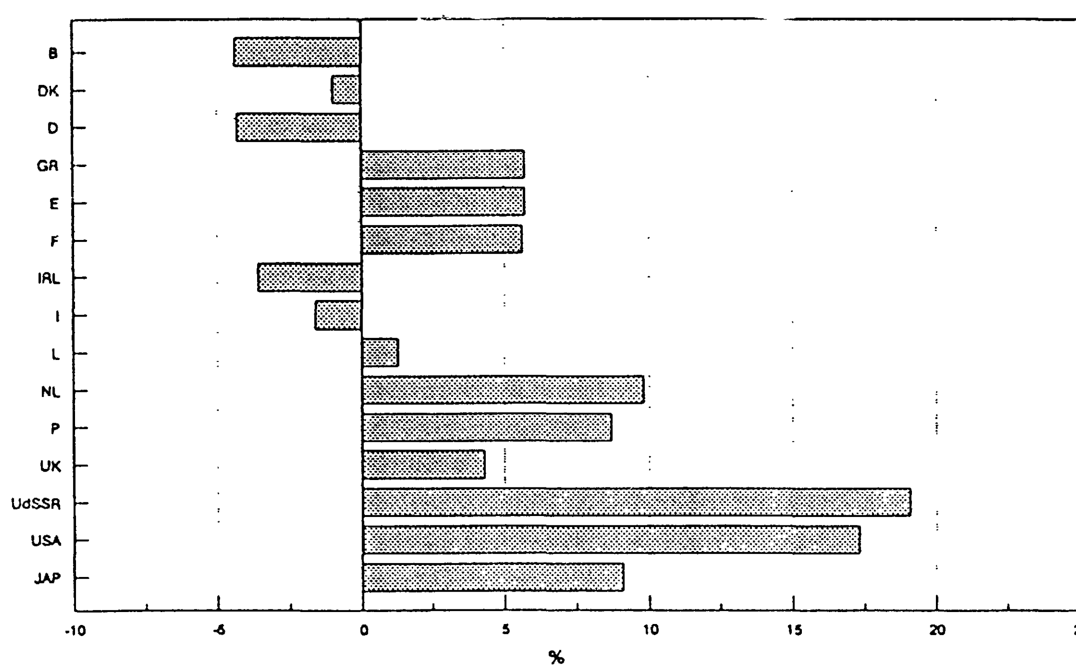


Source: EUROSTAT

The Community population is estimated at 331 673 m for 1990, while according to estimates for the year 2000, a decline in the Community's population to 330 150 m people can be expected.

Figure 3 shows population trends for the Member States, the USA, Japan and the USSR

CHANGES IN POPULATION
FOR THE EC, USA, JAPAN AND THE USSR
1987-2010 (%)

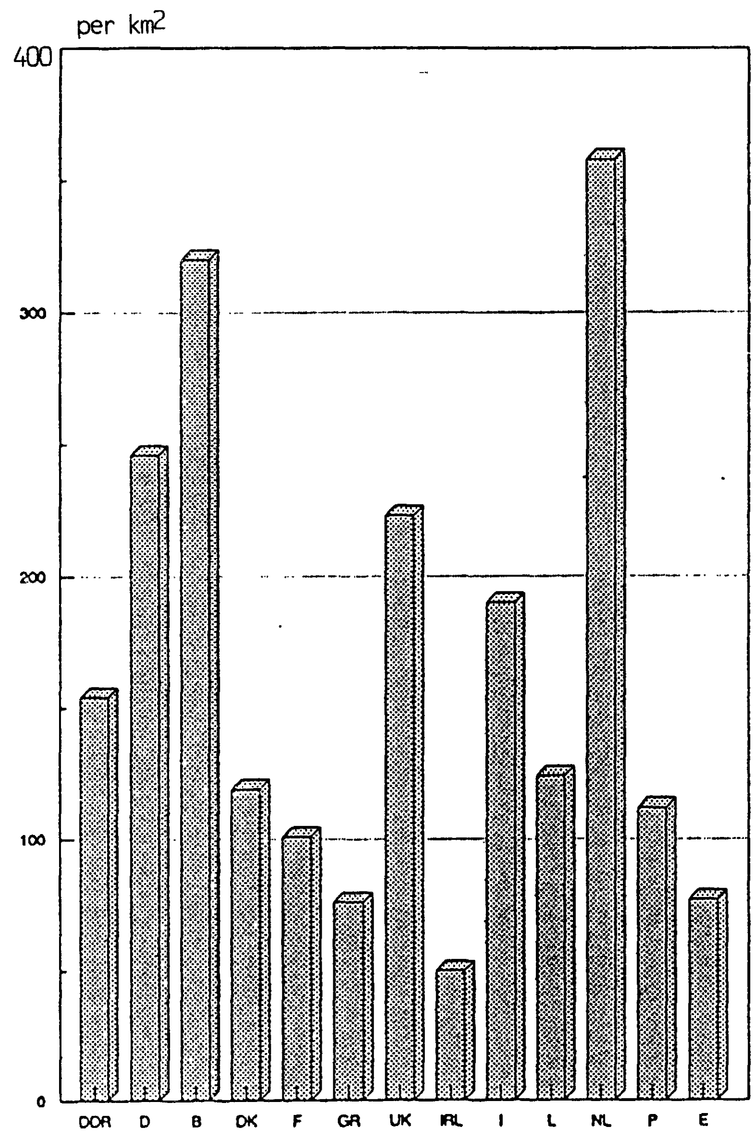


Source: EUROSTAT

Population density varies considerably in the different Member States. In 1987 the average population density for the Community was 143 people per km², for the USA 26 people per km² and for Japan 328 people per km².

Figure 4 shows the population density in the Member States of the Community and the GDR for the year 1987

POPULATION DENSITY IN 1987
(per km²)



Source: EUROSTAT
For the GDR: DG IV (EP)

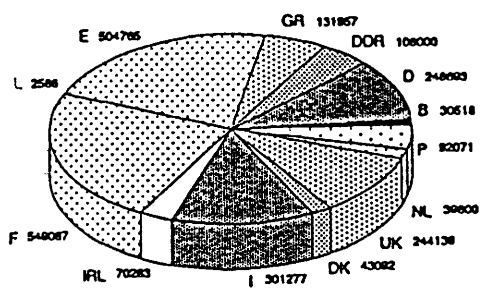
These population density figures are the quotients of the area and number of inhabitants of each state and disregard the actual distribution of population, which is considerably affected by geographical factors (areas of desert, steppes, forests etc.).

Increases in population cause not only poverty and food crises but also problems and difficulties relating to excessive demand for and destruction of the earth's natural resources.

The real problem with demographic growth does not however lie solely in the population figures, but rather in the increasingly critical relationship between population levels and the earth's limited resources (Brundtland report of the World Commission on Environment and Development, 1987, p. 97/98). A consequence of this development is, for example, the rise in development activities enabling various social expectations (social sector aid: health, housing etc., provision of energy and foodstuffs etc.) to be satisfied to at least a certain extent.

Figure 5a shows the total area of the individual Member States of the EC and the area of the GDR and Figure 5b shows the area of the EC in relation to the USA and Japan.

AREA (km 2)



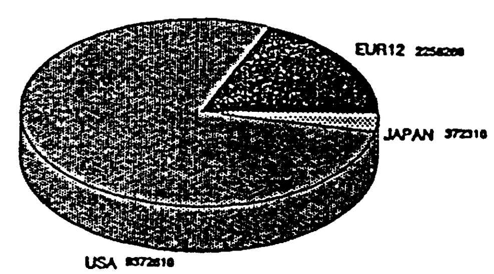
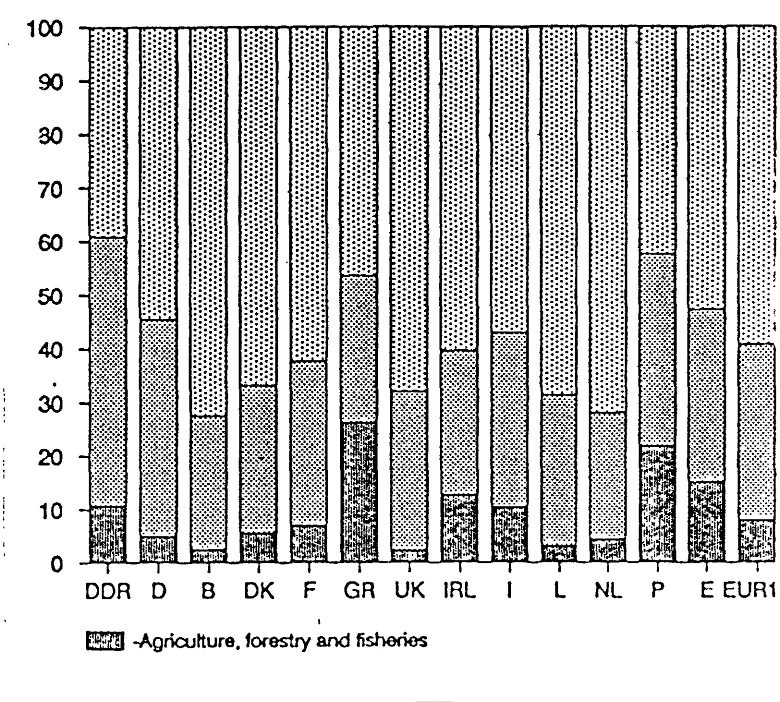


Figure 6 shows the distribution of the working population in the Member States of the EC and the GDR in 1987

DISTRIBUTION OF THE WORKING POPULATION IN 1987 (%)



Source: EUROSTAT
For the GDR: DG IV (EP)

1.2 Economy

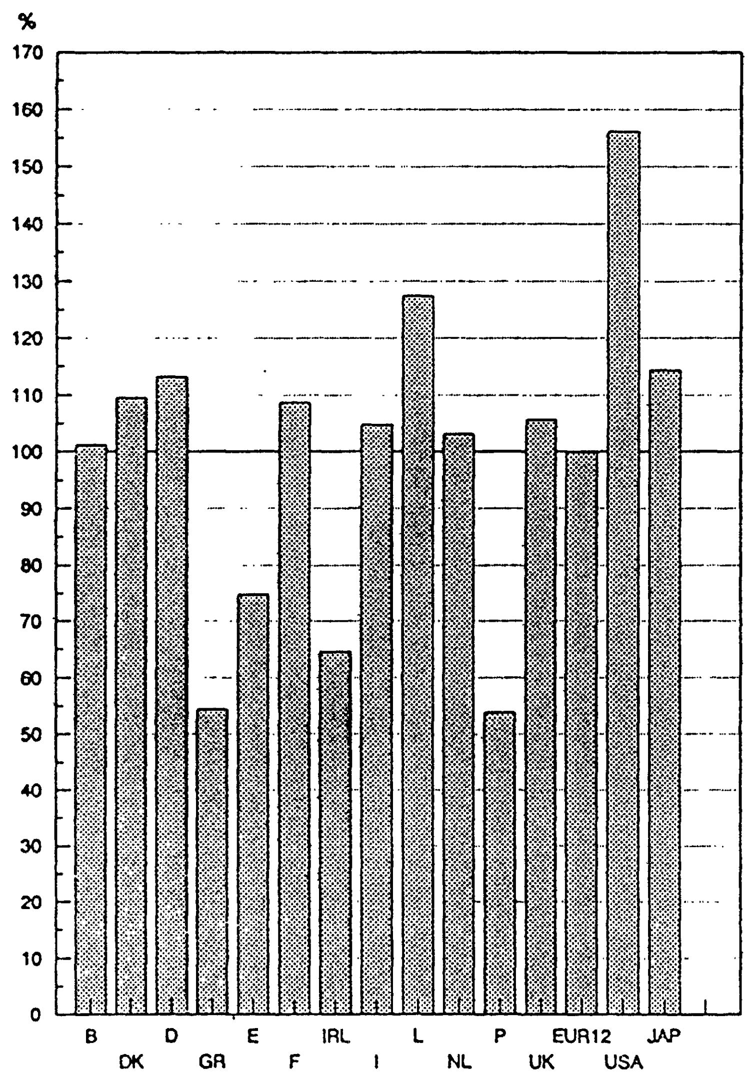
The gross domestic product of an economy (at market prices) gives some insight into the economic activity of the state concerned, which is often cited as an indicator of environmental pollution.

However, economic growth offers more favourable conditions to enable both the state and industrial systems of a country to undertake environmental protection measures.

Figure 7 shows the gross domestic product per inhabitant of the Member States in 1988

GROSS DOMESTIC PRODUCT PER INHABITANT
ECU (EUR 12=100)

1988

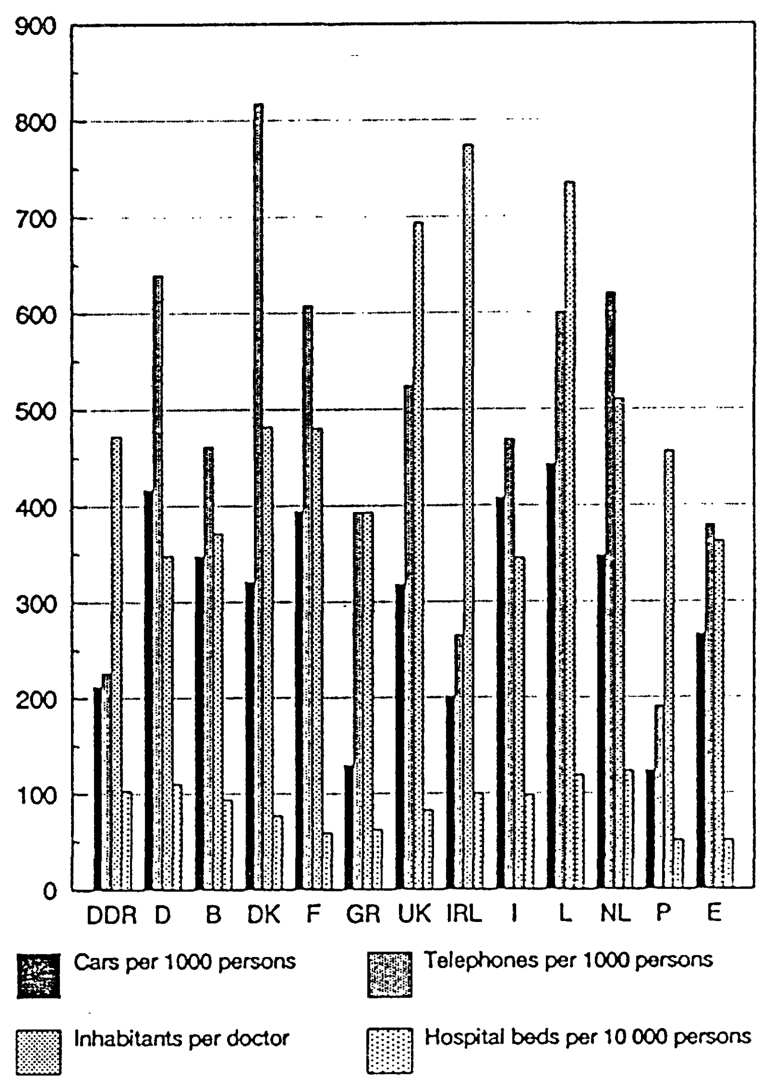


Source: Commission

1.3 Social indicators

Figure 8 shows the distribution of social indicators - cars per 1000 persons, telephones per 1000 persons, inhabitants per doctor and hospital beds per 10 000 persons

SOCIAL INDICATORS, 1987



Source: DG IV (EP)

2. Water

2.1 General

Water, an element in the environment, is essential for physiological processes and is basic to human, animal and plant nutrition. It is a constant part of the global cycles of precipitation, condensation, evaporation and run off. Water is used for many purposes (drinking water supplies, as a means of production, for irrigation, as a coolant, as a vehicle for waste substances, as a means of transport, for recreation and sport, enhancement of the landscape etc.).

The earth's total water resources are estimated at 1.5 bn km^3, with the oceans covering 71% of the earth's surface. However 97% of the earth's water resources are sea water, i.e. salt water which cannot be drunk by humans. The useful freshwater part of total water resources is 0.3%. The major part of the fresh water stocks is in the huge polar ice masses and the high mountain glaciers.

These limited water stocks together with the increased demands for them and the problem of waste water point to the need to be well informed about the situation and future trends in water requirements. Water requirements are a key factor for the political (state institutions) and industrial (water management and industry) systems.

Almost all countries of the world now have serious, if very divergent, water-related problems and the Community's Member States are no exception (e.g. growing demand for water with increasing pressure on the actual supply available.

As well as an adequate water supply, its quality is also very important for sustainable life on earth in the long term.

Ground water, which is naturally well-suited to supplying drinking water, is like surface waters, subject to many sources of pollution (tips, oil accidents during storage and transport, organic halogen compounds, nitrate pesticides, defective sewage systems, etc.).

Surface waters and ground water are polluted in many Community Member States by agricultural pesticides and nitrates, leaks from municipal and industrial waste water systems, rubbish dumps and sewage plants. Community drinking water limit values cannot be met by thousands of Europe's water sources.

2.2 Water withdrawal

Figure 9 indicates total water withdrawal from ground and surface water (infiltration, ground water from recharge sources, river, lake and dam water) for the individual Member States from 1970 to 1985.

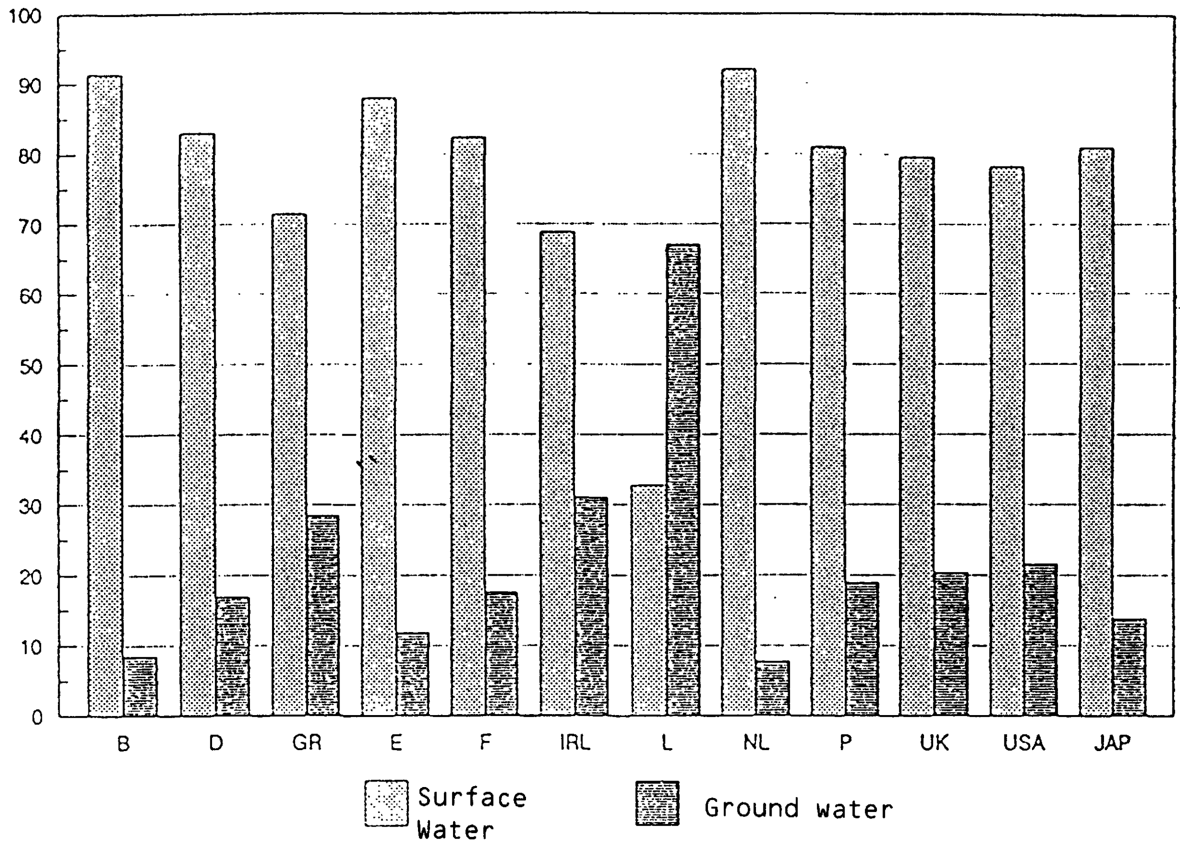
Figure 9: Water withdrawal

	renewable resources 1 m m3/year	total water withdrawal 1 m m3/total				water withdrawal per capita m3/per capita			
		1970	1975	1980	1985	1970	1975	1980	1985
Belgium	8 400	9 481		9 030		984		917	
Denmark	11 000	846	1 230	1 420	1 462	172	243	277	286
FRG	79 000	29 488	33 544	42 206	41 216	486	543	686	675
Greece	45 100	4 254	5 847	6 945		484	546	720	
Spain	110 300	24 600	36 080	39 920	45 250	728	1 016	1 068	1 175
France	170 000		27 000	37 600	39 995		512	698	725
Ireland	50 000			793				233	
Italy	179 400	41 900		56 200		778		996	
Luxembourg	1 000				67				182
Netherlands	10 000	13 270	13 734	14 794	14 471	1 018	1 005	1 046	999
Portugal	34 000	7 900	9 200	10 500		873	1 012	1 075	
UK	120 000	15 583	13 085	12 433	11 511	320	265	251	231
USA	2 478 000	439 000	472 500	522 000	467 000	2 141	2 188	2 292	1 952
Japan	547 000	82 611	84 964	84 831		799	762	726	

Source: EUROSTAT

Figure 10 shows the percentage of ground and surface water in the total water withdrawal for selected Member States, the USA and Japan (most recent data available in each case).

GROUND AND SURFACE WATER WITHDRAWAL (as %)



Source: EUROSTAT
DG IV (EP)

2.3 Waste water

Figure 11 shows the percentage of the population of the Community's Member States served by the public sewerage system (1970-1987). For the purposes of comparison the figures for Japan, the USA and the GDR are added.

Figure 11: Waste water treatment plants

(in %)

	1970	1975	1980	1985	1987
Belgium	4	6	23		
Denmark	54	71		90	98
FRG	62	75	82	87	
Greece			1		
Spain		14	18	29	
France	19		44	50	
Ireland			11		
Italy	14		30		
Luxembourg	28		81	83	
Netherlands		45	68	85	90
Portugal	3	6	10	13	
UK			82	83	84
USA	42	67	70	74	
Japan	16	23	30	36	39
GDR		46.9		55.3	57.7 (1988)

Sources: EUROSTAT
For GDR: IÖW 36/90, p.53

The levels of nutrients and pollutants in water and the seas, the discharge peaks during rain (because of the lack of permeable surfaces in urban areas), leaks in existing systems, the growing amounts of sewage sludge etc., have been increasing even despite the improvement and upgrading of the sewage and waste water treatment systems in the Member State in recent decades.

2.4 Quality of rivers

The tables below show the composition of river waters. The parameters/ indicators given in these tables are explained briefly in terms of sources, causes and risks.

When interpreting these tables it should be noted that the figures are not completely comparable because of differing measurement programmes, methods and frequencies.

Furthermore, no general conclusions should be drawn as regards pollution trends and the water quality of rivers from a comparison of the values for the years 1970 to 1987, as the composition of the water is affected by a wide range of factors (hydrological, meteorogical, inputs, etc.).

2.4.1 Oxygen content and biochemical oxygen demand (BOD)

Figure 12 gives the readings for the oxygen content and the biochemical oxygen demand (BOD) for selected rivers in the ten Member States of the Community for the years 1970 to 1987. The oxygen content is affected not only by natural processes (oxygen is absorbed from the atmosphere, photosynthesis in aquatic plants, natural degradation of organic substances etc.) but also by human activities (e.g. inputs of substances). As most aquatic organisms require a minimum concentration of dissolved oxygen in the water this indicator plays an important role in showing the stability of bodies of water.

The biochemical oxygen demand (BOD) indicates the pressure on the oxygen balance of water. The BOD is an indicator for the quantity of dissolved oxygen required for the biological degradation of organic substances in water. This figure increases in proportion to the quantitative increase in the water of organic substances capable of aerobic decomposition, i.e. the higher the figure the greater the degree of pollution. The BOD thus makes it possible to estimate the level of pollution caused by these substances or indicates the pressure on the body of water concerned.

Figure 12: Oxygen content and biochemical oxygen demand (BOD) for selected rivers.

		Oxygen content mg/l				Biochemical oxygen demand (BOD) (mg/l			
		1970	1975	1980	1985	1970	1975	1980	1985
B	Meuse-Heer/Agimont	8,2	10,8	10,6	10,4	4,4	6,6	4,2	8,0
	Meuse-Lanaye	7,7	8,9	9,5	8,1	12,5	4,7	3,9	4,3
	Escaut-Doel	6,2	1,3	1,9	3,3	4,0	8,2	5,0	3,0
DK	Gudenaa			9,7	10,7			3,4	4,5
	Skjernaa			10,5	10,4			8,2	8,0
	Susaa			8,7	8,7			2,3	2,0
BRD	Rhein Kleve-Bimmen	5,6	6,8	9,0	9,3	6,1	7,9	4,0	3,8
	Elbe			9,0	8,1			6,2	8,6
	Weser	8,6	9,4	8,6	8,7	3,0	5,2	5,4	4,4
	Donau-Jochenstein	10,5	10,3	10,6	10,5	4,8	3,1	3,1	3,2
E	Guadalquivir			3,1	5,7		12,3	11,8	8,8
	Duero			7,5	7,3			2,4	2,7
	Tajo			7,2	7,6			2,4	3,0
	Ebro			9,8	9,4			3,4	4,6
F	Loire	10,7	11,1	11,8	12,1	6,7	4,4	6,6	7,8
	Seine		3,3	4,9	5,2		10,2	6,6	3,2
	Garonne	9,7	9,9	10,1	9,3	2,2	1,5	2,3	2,2
	Rhone	7,5	7,7	8,7	8,6	2,9	9,2	7,8	5,0
I	Po	8,3		7,7	8,6		7,3	6,1	5,0
	Tevere	4,6		5,3	8,8	8,3		9,5	2,0
NL	Meuse-Kelzersveer	8,6	9,4	10,0	9,7	6,2	4,2	2,3	1,6
	Meuse-Eijsden	9,8	9,5	9,8	8,1	4,1	3,7	2,8	2,9
	Nieuwe Waterweg/ Scheur Maas		7,1	8,1	9,3		3,9	2,2	1,5
	Ijssel-Kampen	6,7	6,7	8,1	8,2	6,7	6,3	3,9	2,3
	Rhein-Lobit			8,0	8,0	6,7	7,0	3,2	2,3
P	Tejo			9,2	7,8	1,6		2,5	1,7
	Minho			9,1	10,1			16,1	2,9
UK	Thames		10,8	9,9	10,0		3,4	2,7	2,4
	Severn		10,1	10,4	10,8		2,8	2,6	1,7
	Clyde		7,7	9,4	9,1			4,1	3,2
	Mersey		5,1	6,1	6,2		7,2	5,1	5,0
USA	Delaware-Trenton	9,6	10,8	11,9	10,8	1,9	2,0	2,2	2,1
	Mississippi-St.Franc.	8,4	8,5	8,3	8,6	2,4	2,2	1,7	1,4
J	Ishikari	8,9	10,7	10,6	10,2	1,9	1,4	1,4	1,5
	Yodo	8,2	8,9	9,0	8,2	5,2	3,2	3,5	3,6
	Tone	9,9	10,3	10,2	10,5	1,7	1,5	1,6	1,5
	Shinana	9,8	9,8	9,8	10,6	2,5	1,8	1,5	1,7

Source: EUROSTAT

2.4.2 Nitrate, ammonium, phosphorus

Figure 13 gives the figures for the parameters nitrate, ammonium and phosphorus in selected rivers in the Member States for the period 1970 to 1987.

Nitrates (NO_3) are salts of nitric acid which form the main component of nitrogenous fertilizers. The chief man-made sources are inappropriate use of chemical fertilizers and liquid manure in agriculture, and industrial and municipal waste water.

In Directive 80/778/EEC the Community set a limit value of 50 mg/l for nitrates in drinking water. It should be noted that nitrates cannot be removed using normal drinking water treatment methods.
A further problem with nitrate pollution is eutrophication which reduces oxygen in water and causes the biological death of areas of water.

Ammonium (NH_4) is a nitrogen compound which is produced, inter alia, during the biological decomposition of organic nitrogen compounds. When ammonium enters water courses it is converted to nitrate by microorganisms, at the same time consuming oxygen.

Ammonium is of significance as a toxin when ammonia, which is toxic to fish, is released in waters with high levels of ammonium.

Phosphates are salts of phosphoric acids which are used in large quantities as fertilizers and in washing and cleaning substances.
In water monitoring total phosphorus covers all phosphorus compounds.

Agriculture and domestic and industrial waste water are mainly responsible for the inputs of phosphorus compounds. Uncontaminated springs show total phosphorus concentrations of less than 1 to 10 pg/l of phosphate.

Figure 13: Nitrate, ammonium and phosphorus pollution of selected rivers

		Nitrates			mg NO3/l	Ammonium			mg NH4/l
		1970	1975	1980	1985	1970	1975	1980	1985
B	Meuse-Heer/Agi.	7,97	7,81	9,65	13,82		0,17	0,13	0,18
	Meuse-Lanaze	17,27	9,41	11,16	12,36		1,06	0,79	0,90
	Escaut-Doel	13,29	7,36	18,47	17,32		3,76	2,85	2,82
DK	Gudenaa		5,54	7,53	8,86		0,12	0,15	0,07
	Skjernaa		9,08	13,27	14,08				
	Susaa		23,34	29,80	23,07				
BRD	Rhein Kleve-Bimmen	8,06	13,37	15,90	18,60	1,74	1,48	0,72	0,63
	Elbe			17,27	13,29			1,82	3,64
	Weser		19,04	24,00	22,50	0,73	0,70	0,21	0,13
	Donau Jochenstein	0,89	1,33	2,21	2,66	0,15	0,26	0,15	0,21
GR	Strimonas			4,24	4,85			0,13	0,10
	Axios			4,35	6,76			0,07	0,09
	Pinios			6,05	6,38			0,08	0,02
	Aheloos			0,32	0,34			0,05	0,38

E	Guadalquivir		7,55	9,62	14,32		2,02	1,14	1,11
	Duero			8,16	4,55			0,22	0,27
	Tajo			1,50	2,11			0,26	0,10
	Ebro			5,45	10,91			0,38	0,16
F	Loire	7,01	6,38	8,81	9,81		0,27	0,09	0,12
	Seine		18,52	23,72	27,32		1,57	0,78	1,04
	Garonne	5,10	4,10	8,11	7,51		0,18	0,00	0,27
	Rhone	3,90	4,00	5,50	7,11		0,16	0,15	0,26
I	Po	4,19	5,98	7,22	10,63	0,26		0,22	0,26
	Adige		3,90	4,16		1,19	1,94	1,70	1,09
	Tevere		6,64	6,07					1,51
NL	Meuse-Keizersv.	13,60	16,34	16,70	18,95	0,90	1,59	0,78	0,87
	Meuse-Eijsden	10,85	11,12	12,31	12,93	0,97	1,13	0,64	0,87
	Scheur-Maasluis		14,92	17,01	18,42		1,18	0,81	0,68
	Ijssel-Kampen	12,22	15,32	18,91	19,18	1,71	1,24	0,78	0,60
	Rhein-Lobit	11,87	14,48	17,40	19,97	1,71	1,43	0,97	0,98
P	Tejo	2,30		5,58	4,96	0,43		0,22	
	Minho							0,13	0,09
UK	Thames		28,79	30,51	33,26		0,40	0,34	0,35
	Severn		24,45	25,69	28,03		0,25	0,16	0,27
	Clyde		11,78	8,19	9,57		1,03	1,18	1,50
	Mersey		8,15	10,14	13,82		7,13	5,49	5,53
USA	Delaware-Trenton		3,90	4,78			0,15	0,06	0,11
	Mississippi-St.Franc.		4,34	5,31	5,45		0,06	0,11	0,05
J	Ishikari	1,59		2,35		0,49	0,24		
	Yodo		3,54	3,37		0,72	0,69	0,87	

		Phosphorus			mg P/l
		1970	1975	1980	1985
B	Meuse-Heer/Agi.		1,23	0,22	0,35
	Meuse-Lanaze		1,41	0,55	0,72
	Escaut-Doel		1,06	0,55	0,87
DK	Gudenaa		0,30	0,16	0,18
	Skjernaa			0,22	0,13
	Susaa		0,66	0,26	0,34
BRD	Rhein Kleve-Bimmen	0,52	0,75	0,36	0,48
	Elbe			0,36	0,53
	Weser	0,40	0,67	0,53	0,37
	Donau Jochenstein			0,18	0,21
GR	Strimonas			0,14	0,12
	Axios			0,33	0,61
	Pinios			0,06	0,08
	Aheloos			0,01	0,00
E	Guadalquivir		0,83	0,87	0,72
	Duero			0,69	0,35
	Tajo			0,43	0,14
	Ebro			0,33	0,79
F	Loire	0,08	0,08	0,07	0,04
	Seine		1,45	0,76	1,01
	Garonne	0,08	0,08	0,09	0,09
	Rhone	0,15	0,15	0,18	0,13
I	Po		0,23	0,28	0,26
	Adige		0,19	0,18	
	Tevere		0,26	0,40	0,24

NL	Meuse-Keizersv.	0,41	0,57	0,50	0,48
	Meuse-Eijsden	0,43	0,73	0,58	0,57
	Scheur-Maasluis		0,56	0,65	0,55
	Ijssel-Kampen	0,43	0,62	0,63	0,57
	Rhein-Lobit	0,50	0,72	0,66	0,62
P	Tejo			0,30	0,19
	Minho				
UK	Thames		1,07	1,16	1,32
	Severn		0,75	0,54	0,71
	Clyde		0,69	0,50	0,32
	Mersey		1,00	0,78	1,36
USA	Delaware-Trenton		0,10	0,10	0,13
	Mississippi-St.Franc.		0,19	0,23	0,14
J	Ishikari		0,09	0,09	0,07
	Yodo		0,19	0,22	0,16

Source: EUROSTAT

2.4.3 Heavy metals

Heavy metals occur in water in dissolved and undissolved form with a large proportion being absorbed in particulates and deposited in still water areas.

Lead (Pb), Cadmium (Cd), Copper (Cu) and Chromium (Cr) are among the most important environmental pollutants among the heavy metals and because of their toxicity and persistence cause serious pollution problems. Waste water containing heavy metals places a heavy load on biological water treatment plants. The heavy metals accumulate in living organisms, reach the food chain in various ways, disturb growth and cause metabolic problems in organisms.

Significant sources are vehicles, industry (chemical industry, waste incineration plants etc.), mining, agriculture (plant protection substances, pesticides and fertilizers) and domestic waste water.

Lead (Pb), a blueish soft heavy metal, and its compounds, mainly in powder or dissolved form are dangerous environmental toxins.
Even small traces of lead affect the nervous system and formation of the blood if absorbed persistently.

Cadmium (Cd) is a silvery-white, bright metal which is used in various fields (as a stabilizer in the plastics industry (PVC)), in the production of batteries (nickel-cadmium batteries), as a dye pigment, in the manufacture of electro-plated metal components, in the fertilizer industry (use of sewage sludge), disposal measures for products containing cadmium etc..

Persistent cadmium pollution can cause damage to lungs and kidneys and, under certain circumstances can affect bones (Itai-Itai disease).
Cadmium in high concentrations restricts plant growth.

Copper (Cu) is frequently used for wiring in the electrical industry and in the laying of pipelines.

Dissolved copper salts are very harmful in water and are strong toxins even in very small quantities.

Figure 14 shows the heavy metal concentrations in rivers in various Member States for lead, cadmium, copper and chromium for the period 1970 to 1987.

Figure 14: Lead, cadmium, copper and chromium levels in selected rivers

		Lead			ug/l	Cadmium			ug/l
		1970	1975	1980	1985	1970	1975	1980	1985
B	Meuse-Heer/Agi.		1,40	4,00	9,12		0,80	0,30	0,22
	Meuse-Lanaye		5,70	20,00	6,71		2,60	1,20	0,39
	Escaut-Doel		203,50	25,00	6,22		1,50	5,80	1,22
BRD	Rhein Kleve-Bimmen		24,00	7,00	11,00		2,40	1,40	0,30
	Weser			2,00	2,80			0,50	0,50
	Donau-Jochenstein			1,40	2,60			0,20	0,10
E	Guadalquivir		20,00	12,70	28,00			0,00	0,60
	Ebro			5,00	0,00			0,00	0,00
F	Loire		0,00	0,00			0,00	0,00	0,00
	Seine		26,00	8,00	40,00		2,00	2,00	0,00
	Garonne		4,25	10,00	0,00		1,25	1,00	0,00
	Rhone		30,00	29,00			10,00	5,00	0,00
I	Po		0,40	0,55			0,16	0,05	0,30
NL	Meuse-Keizersv.		12,00	12,00	3,60		0,90	1,50	0,21
	Meuse-Eijsden		17,00	23,00	6,20		3,10	3,40	0,35
	Scheur-Maasluis		13,00	11,00	1,90		1,00	0,90	0,26
	Ijssel-Kampen		17,00	9,00	5,00		1,40	1,30	0,40
	Rhine-Lobit		22,00	15,00	4,20		2,30	1,60	0,14
UK	Thames			10,00	9,00			1,04	0,79
	Severn		29,00	40,00	4,00		5,17	10,00	0,21
	Clyde		73,00	18,00	8,00		3,80	1,08	0,78
	Mersey		50,00	15,00	11,00		20,00	0,79	0,19
USA	Delaware-Trenton		6,00	2,00	3,00		2,00	3,50	2,00
	Mississippi-St.Fran.		2,00	2,00	5,00		2,00	2,00	2,00
J	Ishikan	210,00	1,00	5,00		0,00		0,00	
	Yodo		1,00	0,00		0.00	0,00	0,00	

		Chromium ug/l				Copper ug/l			
		1970	1975	1980	1985	1970	1975	1980	1985
B	Meuse-Heer/Agi.		1,20	1,20	0,40		4,70	7,00	19,00
	Meuse-Lanaye		4,60	2,70	5,70		4,50	22,60	7,40
	Escaut-Doel		15,60	26,10	3,60		15,50	24,40	10,90
BRD	Rhein Kleve-Bimmen		40,00	22,30	10,00		24,00	19,90	13,00
	Weser			3,00	3,00			5,60	9,20
E	Guadalquivir		24,00	10,00			0,00	2,70	0,90
	Duero			0,00	0,00			0,80	2,50
	Tajo			0,00	5,00				1,40
F	Loire		0,00	0,00			0,00	10,00	20,00
	Seine		12,00	13,00	20,00		52,00	11,00	30,00
	Garonne	20,00	9,00	1,67	0,00		10,83	10,00	0,00
	Rhone		0,00	9,00			14,00	28,00	
I	Po		0,50	0,60			0,60	0,85	
NL	Meuse-Keizersv.		7,00	7,00	3,00		9,00	12,00	3,50
	Meuse-Eijsden		14,00	10,00	6,40		16,00	11,00	5,50
	Scheur-Maasluis		16,00	19,00	5,30		15,00	12,00	4,90
	Ijssel-Kampen		25,00	14,00	7,00	26,00	16,00	9,00	7,00
	Rhine-Lobit		35,00	20,00	7,60		20,00	14,00	5,90
UK	Thames			11,00	10,00			10,00	11,00
	Severn		9,00	30,00	11,00		18,00	21,00	12,00
	Clyde		64,00	25,00	21,00		63,00	10,00	6,00
	Mersey		20,00	20,00	12,00		20,00	19,00	9,00
USA	Delaware-Trenton		27,50	10,00	3,00		20,00	3,50	4,80
	Mississippi-St.Fran.		7,80	10,00	2,00		4,00	6,30	5,60
J	Ishikan	0,00	0,00	0,00		35,00	3,00	18,00	3,00
	Yodo		0,00	0,00			0,00	8,00	

Source: EUROSTAT

2.5. Quality of lakes

Figure 15 gives the levels measured for phosphorus and nitrate in selected lakes in the EC, USA and Japan for 1970 to 1987.

Figure 15: Phosphorus and nitrate levels in selected lakes

		Phosphorus			mgPO/l	Nitrates			mgN/l
		1975	1980	1985	1987	1975	1980	1985	1987
DK	Knud Soe	0,060	0,050	0,042	0,025	2,000	3,000	2,900	3,000
BRD	Bodensee	0,099	0,099	0,071	0,088	0,763	0,856	0,875	1,013
E	Alcantara	0,387	2,570			1,341	2,864		
F	Aydat	0,053				0,694			
	Pavin	0,282							
IR	Ennel	0,089	0,029	0,032		0,270	0,470	0,388	
	Derg	0,025	0,020	0,058		0,840	1,200	1,040	
I	Maggiore	0,026	0,036	0,019			0,770		
	Como	0,068	0,078	0,052		0,710	0,800	0,800	
	Garda	0,009	0,020	0,011		0,300	0,390	0,350	
	Orta		0,011	0,006		9,620	9,500	7,110	
NL	Ijssel	0,350	0,350	0,290	0,210	4,025	4,385	4,140	4,450
P	Ria de Aveiro		0,015	0,026					
UK	Neagh	0,095	0,107	0,114	0,940	1,180	1,580	1,920	1,500
	Lomond		0,009	0,009	0,005		0,300	0,290	0,230
USA	Cayuga (NY)	0,020				0,510			
	W. Twin (Ohio)	0,100							
J	Biwa (North)	0,008	0,010	0,009	0,010	0,290	0,290	0,270	0,270
	Biwa (South)	0,027	0,027	0,027	0,024	0,530	0,410	0,410	0,370
	Kasumigaura	0,040	0,080	0,060	0,060	1,200	1,000	1,200	1,300

Source: EUROSTAT

2.6 Quality of the North Sea

The North Sea plays an important role in a range of areas. It is used for recreation and leisure activities and for the disposal of waste and waste water (decomposition, dumping, dilution and dispersion). It is an ecologically important site (breeding grounds, habitat and source of food for a broad spectrum of birds and mammals) and serves as a transport route between European and other ports (the North Sea is one of the sea areas with the highest traffic density).

The blooms of plankton, the toxic form of the alga Chrysochromulina polylepis which occurred in 1988 off the Scandinavian coast and the large-scale death of seals in 1988, the causes for which have still not been established satisfactorily, provide examples of the effects of pollution in the North Sea.

In general terms it should be noted that the North Sea is used heavily by the states bordering on it, Belgium, Denmark, the Federal Republic of Germany, the Netherlands, Norway, Sweden and the United Kingdom, and that it is also polluted by inputs which enter the North Sea indirectly via the major river systems and the atmosphere from countries which do not border on the sea.

The main sources for inputs into the North Sea are inputs from the atmosphere, the discharge of industrial and municipal waste water from the land, inputs of industrial waste, dredged material and sewage sludge, inputs from rivers, incineration of waste at sea, platforms, shipping and tourism.

At the third North Sea conference in the Hague from 7 to 8 March 1990 a complete ban on the discharge of industrial waste in the North Sea was agreed for 1993, with the discharge of polychlorinated biphenyls (PCBs) being permitted until 1999. However the agreements reached should be seen in the light of the fact that numerous decisions taken at the second North Sea conference in 1987 have still not been implemented (e.g. the 50% reduction in nitrate discharges, the ban on the dumping of toxic substances etc.).

Figure 16 shows the inputs of nutrients and pollutants into the North Sea in tonnes per annum by sources.

Figure 16: Nutrient and pollutant inputs into the North Sea

Source	Nitrogen		Phosphorus		Cd		Hg	
	max.	min.	max.	min.	max.	min.	max.	min.
Rivers	1 000 000	-	76 000	-	52	46	21	20
Direct discharges	95 000	-	25 000	-	20	20	5	5
Atmosphere	400 000	-	unknown	-	240	45	30	10
Dumping of								
- dredged material	unknown	-	unknown	-	20	-	17	-
- sewage sludge	11 700	10 000	2 800	2 200	3		0,6	-
- industrial waste	unknown	-	unknown	-	0,3	-	0,2	-
incineration at sea	unknown	-	unknown	-	0,1	-	Traces	
Total (rounded)	1 500 000	-	100 000	-	335	135	75	50

Source: Quality Status of the North Sea, September 1987

	Cu				Zn		Cr		Ni	
	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.
Rivers	1 330	1 290	980	920	7 370	7 360	630	590	270	240
direct discharges	315	-	170	-	1 170		490	-	115	-
Atmosphere	1 600	400	7 400	2 600	11 000	4 900	900	300	950	300
dumping of										
- dredged material	1 000	-	2 000	-	8 000		2 500	-	700	-
- sewage sludge	100	-	100	-	220	-	40	-	15	-
- industrial waste	160	-	200	-	450	-	350	-	70	-
incineration at sea	3	-	2	-	12	-	1,7	-	3	-
Total (rounded)	4 500	3 000	11 000	6 000	28 000	22 000	5 000	4 200	2 100	1 450

Source: **Quality Status of the North Sea, September 1987**

Figure 17 shows the percentage of pollutants in the North Sea derived from individual sources

Source	Nitrogen		Phosphorus		Cd		Hg	
	max.	min.	max.	min.	max.	min.	max.	min.
Rivers	67	67	75	75	15	34	28	40
Direct inputs	6	6	23	23	6	15	8	9
Atmosphere	26	26	unknown	-	72	34	40	20
dumping of								
- dredged material	unknown	-	unknown	-	6	15	23	30
- sewage sludge	1	1	2	2	1		1	1
- industrial waste	unknown	-	unknown	-	0	0	0	0
incineration at sea	unknown	-	unknown	-	0	0	0	0

Source: **Quality Status of the North Sea, September 1987**

These tables do not take into account the inputs which enter the North Sea from the North Atlantic, the Channel and the Baltic. The data is mainly from 1983 to 1986. Where a nutrient or pollutant is listed as a cause of pollution in the North Sea the maximum or minimum values have been given in the table. Where only one figure is available it has been placed in the maximum column and '-' has been placed in the minimum column. When no figures are known 'unknown' appears in the maximum column and '-' in the minimum column.
The total of the maximum column is the total of the figures in this column. The total of the minimum column is the sum of the minimum figures and the maximum figures in those cases where no minimum figures are known.
It should be noted that all figures for inputs, with the possible exception of those for dumping, are subject to numerous factors which vary and are difficult to quantify.

2.7 Quality of the Mediterranean

2.7.1 General

335 m people live along the Mediterranean coast and each year 100 m tourists visit the area. The Mediterranean serves as the catchment area for their solid and liquid waste. The environmental problems caused as a result are wide-ranging: from water and air pollution to the destruction of the nesting grounds for migratory and other birds, from the extinction of endangered species such as sea turtles and mammals to the eradication of whole fishing grounds and the destruction of the Mediterranean landscape.

There are four main sources of marine pollution: municipal and industrial waste water, which is discharged directly or from rivers into the sea and is mostly untreated (more than 70% of municipal waste water falls into this category), insecticides, pesticides and fertilizers used in agriculture, oil and other chemical residues from ships or industrial plants, unsupervised waste disposal, in particular of plastics, some of which float on the water's surface.

The heavy metals, nutrients, oils, organochlorines and other chemical compounds and solid organic and inorganic waste which enter the sea from these sources pollute the beaches and the sea water, encourage the formation of algae, destroy marine vegetation and enter the food chain via the fish, birds and sea mammals in which many of such substances accumulate.

2.7.2 Heavy metals

Heavy metals enter the sea not only through rivers or directly from coastal discharges but also through dumping and from the atmosphere. The estimates for lead inputs from the atmosphere are 300 to 1 800 mg/cm^2/year and for cadmium 10 - 50 mg/cm^2/year.

The table below gives an overall picture:

Table 17a **Inputs of heavy metals to the Mediterranean Sea.**

Heavy metal	Atmospheric input (t/yr)	Riverine input (t/yr)
Lead	5,000 - 30,000	2,200 - 3,100
Zinc	4,000 - 25,000	11,000 - 17,000
Chromium	200 - 1,000	350 - 1,900
Mercury	20 - 100	30 - 150

Source: The state of the environment in the European Community, p.268

With regard to concentrations of heavy metals in the Mediterranean, the figures given for concentrations in sea water and in sediments must be approached with caution because of the varying methods of analysis used. More precise figures can be obtained by assessing the concentrations of heavy metals in mussels, as they are most sensitive to the uptake of heavy metals. Figure 17b shows the concentrations of heavy metals in Mytilus species.

Figure 17b: Heavy metal concentrations in flesh of Mytilus species from different regions of the Mediterranean Sea

Region	Metal (µg/g dry weight)				
	Cadmium	Copper	Zinc	Lead	Mercury
Ligurian Sea	0.4-5.9	2.4-154	97-644	2.4-117	0.18-0.96
Gulf of Trieste	1.4-1.7	6.2-9.8	87-137	3.8-15	0.28-1.3
Turkish Aegean	6.6-12	36-64.5	336-452	83-110	0.89-1.1
S.W. Mediterranean	0.3-6.5		7.2-71		0.25-0.63

Source: The State of the Environment in the European Community, p. 275

2.7.3 Organochlorines

Organochlorines such as PCBs and PCTs are of special interest as they are highly toxic and persistent pollutants which, because they are fat-soluble, accumulate readily in marine organisms and build up in the food chain until they reach toxic levels in higher organisms.

Organochlorines from sources on land enter the sea as a result of run off or deposition. For the Mediterranean, for example, riverine inputs into the sea are about 90 t each year. No data is available on atmospheric inputs into the Mediterranean.

The highest concentrations occur in areas near urban coastal districts and large estuaries, in particular in the Gulf of Cathera where the PCB content in sediments reached levels of 463 mg/g.

2.7.4 Oil

The main oil inputs into the sea occur as a result of oil tanker accidents. Other inputs come from ships and off-shore oil installations, the dumping of sewage sludge, industrial waste and dredged material and indirectly from stream waters and atmospheric deposition. Each year oil inputs into the Mediterranean amount to about 0.1 - 1m. tonnes. It is estimated that 650 000 t of oil, approximately 17.5 times as much as was split in the Exxon Valdez incident, pollute the Mediterranean each year, 65 000 t. as a result of accidents.

Oil concentrations in Mediterranean waters are on average almost 5 mg/l, with heavy oil pollution occurring in shipping lanes in particular in the eastern Mediterranean where until recently ships were allowed to discharge oil. Concentrations of 50 mg/l have been recorded in this area. The extent of the pollution is indicated by the widespread incidence of oil slicks and tar balls.

2.7.5 Nutrients

The main sources for land-derived nutrient inputs are the rivers, which transport a total of 320 000 t of phosphorus and 800 000 t of nitrogen into the Mediterranean. Especially in heavily populated estuaries this causes localised oxygen shortfalls and increased algal growth, for example in the Adriatic.

3. Air

3.1 General

Industrial pollution, high-capacity power plants, motor vehicle traffic and private heating are all significant sources of air pollution, emitting varying quantities of a range of pollutants.

Air pollution has wide-ranging consequences for humans, animals, plants, goods and monuments. In regions with high levels of air pollution there are significantly more pollen allergies among small children, who also have higher levels of benzol and tuluol, exhaust gases, in the blood.
Not only human health is at risk. The effects of air pollution are also apparent in the natural environment with growth being affected, the occurrence of previously unknown diseases, the extinction of whole species, the death of forests as a result of acid rain and the effects of ozone.

The tables which follow (19-31) indicate the trends in the emissions of atmospheric pollutants: sulphur oxides (SO_x), nitrogen oxides (NO_x), carbon monoxide (CO), hydrocarbons (HC) and carbon dioxide (CO_2).

When considering this section it should be borne in mind that human involvement in the production of air pollutants varies for individual pollutants. Thus SO_x emissions can largely be traced back to human activities while 80% of CO and 60% OF NO_x emissions are derived from natural sources.

3.2 Atmospheric pollutants

Figure 18 gives the emissions of air pollutants carbon dioxide (CO_2), sulphur dioxide (SO_2), nitrogen oxides (NO_x), carbon monozide (CO), hydrocarbon (HC) and emissions of particles for 1986 for the 12 Member States, the GDR, USA, Japan and total world figures.

When interpreting this and subsequent tables it should be borne in mind that the measurement methods, definitions and estimates with regard to these pollutants may vary from Member State to Member State.

Figure 18 Total emissions of the air pollutants CO_2, SO_2, NO_x, CO, HC and emissions of particles 1986

	CO_2 (Mio t)	SO_x (1000 t SO_2)	NO_x (1000 t NO_2)	Emissions of particles (1000 t)	CO	HC
B	28 678	-	-	-	-	-
DK	16 694	278	270	-	-	-
D	204 308	2 223	2 969	562	8 926	2 436
GR	15 294	-	-	-	-	-
E	49 837	-	-	-	-	-
F	98 748	1 583	1 698	360	6 431	-
IR	7 632	-	-	-	-	-
I	94 149	2 075	1 570	413	5 571	767
L	2 505	-	-	-	-	-
NL	42 320	274	560	153	1 229	470
P	7 844	-	-	-	-	-
GB	157 228	3 871	2 217	270	5 076	2 321
GDR		5 200	700	200	-	350
EUR12	725 238	-	-	-	-	-
USA	1 191 398	21 200	19 300	6 800	60 900	19 500
Japan	241 202	-	-	-	-	-
World - total	5 374 000	-	-	-	-	-

Source: EUROSTAT
for GDR: IÖW, 36/90

3.2.1 Sulphur dioxide (SO_2)

Sulphur dioxide (SO_2) is a colourless, pungent, irritant gas which is produced during the combustion of sulphur and in particular of sulphureous fossil fuels such as oil and coal. Sulphur dioxide is one of the main factors in air pollution and can cause irritation of the mucus membranes of the eyes and the respiratory tract.

Figure 19 gives the absolute and percentage change in sulphur dioxide emissions in the Member States in the immediate past by comparison with the values for 1980.

Figure 19: Changes in sulphur dioxide emissions

Member State	total emissions of SO_2 in kt/year	Year	total emissions of SO[1] (in kt in 1986)	absolute and percentage decrease/ increase in emissions by comparison with figures for 1980	
B	610	1983	856	-246	-28,7 %
DK	248	1987	452	-204	-45,1 %
D	2223	1986	3187	-964	-30,2 %
GR	-	-	546	-	-
E	-	-	2543	-	-
F	1517	1987	3512	-1995	-56,8 %
IR	138	1985	217	-79	-36,4 %
I	2075	1986	3211	-1136	-35,4 %
L	13	1985	24	-11	-45,8 %
NL	249	1987	462	-213	-46,1 %
P	286	1985	266	+20	+7,5 %
UK	3867	1987	4836	-969	-20,0 %
GDR	5208,7	1988	5358,3	-150	-1,8 %

Source: EUROSTAT
for the GDR: IÖW 36/90 Annex

In order to demonstrate the change, the most recent figures were used in each case for the individual states, a factor which should be borne in mind when analysing this table.

Apart from Portugal, there has been a clear reduction in sulphur dioxide emissions by comparison with 1980 in all Member States. For Greece and Spain figures are available only for 1980.

Figure 20 gives the absolute values for SO_2 emissions, by sector and type of fuel for the period since 1980 and the probable trend until 2010.

Figure 20: trend in SO_2 emissions for EUR 12

SO_2 in

1000 tonnes (for EUR12)	1980	1986	1990	1995	2000	2010
Power generation	9 946	8 610	8 301	6 495	3 855	552
Solid fuels	5 896	6 508	6 012	4 410	2 561	487
Oil	4 022	2 081	2 270	2 072	1 287	61
Gas	29	21	19	13	7	4
Other transformations	0	0	0	0	0	0
Solid fuels	0	0	0	0	0	0
Oil	0	0	0	0	0	0
Gas	0	0	0	0	0	0
Energy sector	1 495	819	714	752	760	721
Solid fuels	39	23	15	13	12	9
Oil	1 400	758	699	739	748	712
Gas	55	39	0	0	0	0
Industry	4 243	2 116	2 473	2 516	2 415	2 394
Solid fuels	457	657	544	584	620	732
Oil	3 743	1 404	1 871	1 879	1 746	1 616
Gas	43	55	58	52	49	46
Residential/Commercial	2 307	1 296	1 131	1 064	925	775
Solid fuels	571	501	447	390	309	248
Oil	1 735	794	685	675	616	526
Gas	1	1	0	0	0	0
Transport	615	559	669	719	750	790
Solid fuels	1	0	0	0	0	0
Oil	614	559	669	719	750	790
Gas	0	0	0	0	0	0
Total	18 606	13 400	13 288	11 546	8 705	5 232
Solid fuels	6 964	7 690	7 017	5 398	3 502	1 476
Oil	11 514	5 594	6 194	6 083	5 148	3 706
Gas	128	116	77	65	56	50

Source: COM(89) 369 final

3.2.2 Nitrogen oxides (NO_2)

The nitrogen oxides (NO_x) are a mixture of colourless nitric oxide (NO) and red-brown nitrogen dioxide (NO_2). The nitrogen oxides are by-products of all combustion processes. Man-made NO_x emissions have increased sharply since 1970, in particular because of the growth in traffic.

Figure 21 shows the absolute nitrogen oxide emissions (NO_x) for the EC Member States, the USA and Japan for the period 1970 to 1987 in 1000t NO_2.

More or less complete data is available for this period only for the following Member States: Denmark, Federal Republic of Germany, France, Italy, the Netherlands and the United Kingdom.

Figure 21: Trend in nitrogen oxide emissions

(in 1000 t NO_2)

	1970	1975	1980	1981	1982	1983	1984	1985	1986	1987
Belgium			317		297	271				
Denmark	59	182	245	212	228	223	230	262	270	266
FRG	2345	2532	2935	2851	2825	2869	2931	2924	2969	
Greece			217							
Spain			937							
France	1322	1608	1861	1779	1767	1715	1686	1700	1698	1652
Ireland		60	71	68	68	67	67	68		
Italy		1499	1585				1529	1555	1570	
Luxembourg			23			22		21,7		
Netherlands	430	447	553	547	537	533	550	548	560	229
Portugal	71,6	103,6	166			192		303		
UK	2172	2156	2264	2188	2173	2094	1965	2118	2217	2303
USA	18100	19100	20300	20200	19400	19000	19800	19800	19300	
Japan		1550	1339			1416				

Source: EUROSTAT

Source: EUROSTAT

Figure 22 shows nitrogen oxide emissions from mobile sources (motor vehicles and road, rail and air traffic) for the period 1970 - 1987

Figure 22: Trends in nitrogen oxide emissions from mobile sources

(in 1000 t NO_2)

	1970	1975	1980	1981	1982	1983	1984	1985	1986	1987
Belgium			120		120	120				
Denmark	59	78	80	79	81	82	85	89	94	95
FRG	1044	1297	1594	1558	1582	1615	1677	1718	1803	
Greece			137							
Spain			429							
France	537	857	1021	1046	1053	1065	1085	1130	1182	1172
Ireland		16	20	21	20	19	18	19		
Italy		768	753				779	793	810	
Luxembourg			12			13		14		
Netherlands	227	248	336	331	327	328	337	329	341	
Portugal	55	78	106			120		116		
UK	776	851	946	926	968	897	923	952	997	1066
USA	7600	8900	9200	9300	8900	8600	8700	8800	8500	
Japan		638	540			695				

Source: EUROSTAT

Figure 23 shows nitrogen oxide emissions from stationary sources (power stations, heavy industry, housing) for the EC Member States, the GDR, USA and Japan.

Figure 23: Trends in nitrogen oxide emissions from stationary sources

(in 1000 t NO_2)

	1970	1975	1980	1981	1982	1983	1984	1985	1986	1987
Belgium			197		177	151				
Denmark		104	165	133	147	141	145	173	176	171
FRG	1301	1235	1341	1293	1243	1254	1254	1206	1166	
Greece			80							
Spain			508							
France	785	751	840	733	714	650	601	570	516	480
Ireland		44	51	47	48	48	49	49		
Italy		731	832				750	762	760	
Luxembourg			11			9		7,7		
Netherlands	203	199	217	216	210	205	213	219	219	229
Portugal	16,6	25,6	60			72		187		
UK	1396	1305	1318	1262	1205	1197	1042	1166	1220	1237
USA	10500	10200	11100	10900	10500	10400	11100	11000	10800	
Japan		912	799			721				
GDR								383,6	416,4	400,7

Source: EUROSTAT
For the GDR: IÖW 36/90 Annex

Figure 24 gives the absolute values for NO_x emissions, by sector and fuel category, for EUR 12 (1980 - 2010)

Figure 24: Trend in NO_x emissions for EUR 12 (in 1000 t)

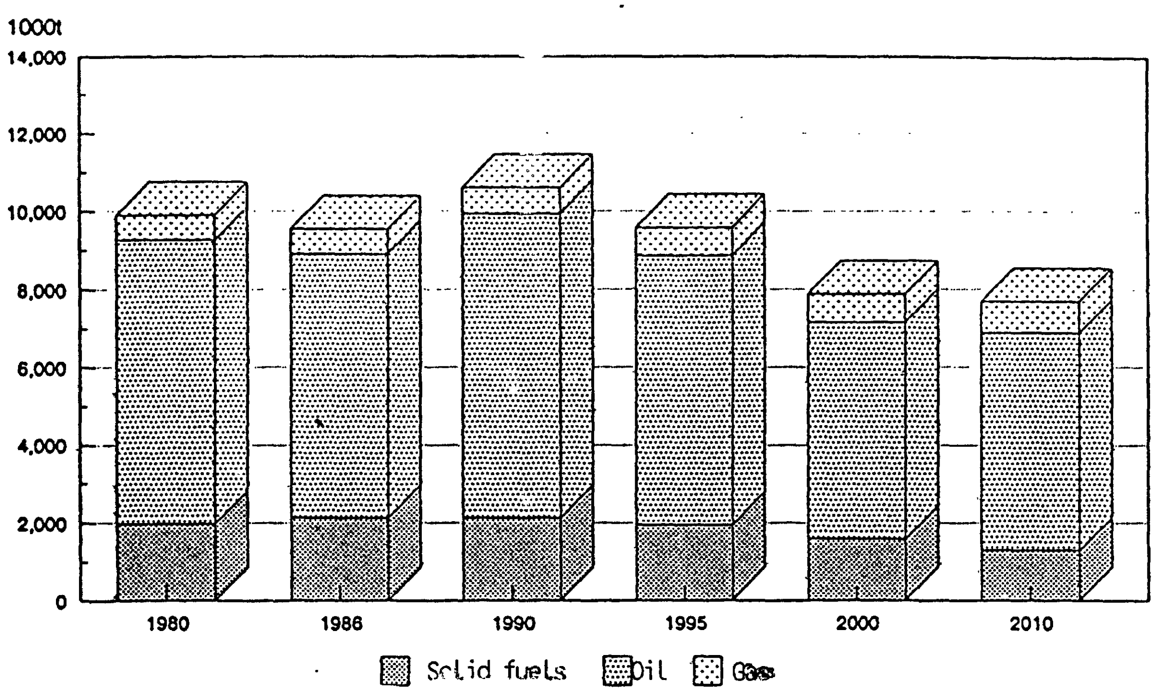
	1980	1986	1990	1995	2000	2010
Power generation	2 578	2 395	2 513	2 303	1 735	1 298
Solid fuels	1 782	1 894	1 927	1 746	1 383	1 085
Oil	607	337	429	392	213	45
Gas	189	164	157	165	139	169
Other transformations	0	0	0	0	0	0
Solid fuels	0	0	0	0	0	0
Oil	0	0	0	0	0	0
Gas	0	0	0	0	0	0
Energy sector	270	210	214	229	231	247
Solid fuels	8	5	4	3	3	2
Oil	228	172	198	212	213	231
Gas	34	32	12	14	15	14
Industry	904	718	772	795	797	846
Solid fuels	106	164	149	160	170	201
Oil	550	314	333	331	309	290
Gas	248	241	290	304	318	356
Residential/Commercial	662	611	539	545	528	504
Solid fuels	76	69	52	45	35	28
Oil	426	345	263	259	237	204
Gas	160	197	223	241	255	273
Transport	5 488	5 621	6 580	5 716	4 595	4 804
Solid fuels	0	0	0	0	0	0
Oil	5 488	5 621	6 580	5 716	4 595	4 804
Gas	0	0	0	0	0	0

Source: COM(89) 369 final

Figure 24a shows the trend in total NO_x emissions from solid fuels, oil and gas for the period 1980 to 2010

Figure 24a:

TREND IN NO_x EMISSIONS FOR EUR 12
(in 1000t)



Source: COM(89) 369 final

3.2.3 Carbon monoxide (CO)

Carbon monoxide is a colourless odourless, flammable and extremely poisonous gas (it is fatal in permanent concentrations of 0.05% by volume) which is contained in the gases from incomplete combustion processes. CO is formed during the combustion of carbon or carboniferous fuels where there is insufficient oxygen and in the exhaust gases from combustion engines. CO is toxic mainly because it impedes oxygen flow through the bloodstream (it bonds strongly with oxygen - carrying hemoglobin) and causes symptoms of headaches, dizziness, nausea, vomiting and subsequently drowsiness, unconsciousness and death.

Figure 25 gives the CO emissions for 1970 to 1987 for the EC Member States for which data is available. For comparison, data for the USA is added.

<u>Figure 25</u>: Trend in CO emissions (in 1000 t.)

	1970	1975	1980	1985	1986	1987
FRG	14 036	13 014	11 708	8 804	8 926	-
France	-	6 522	6 620	6 298	6 431	6 198
Ireland	-	388	497	456	-	-
Italy	-	-	5 487	5 417	5 571	-
Netherlands	1 991	1 913	1 450	1 252	1 229	-
UK	4 846	4 572	4 999	4 872	5 076	
	5 264					
USA	98 700	81 000	76 100	64 300	60 900	-

Source: OECD report p.27

3.2.4 Hydrocarbon (CH)

Hydrocarbon (CH) is a collective term for a number of chemical compounds which often contain other elements in addition to carbon and hydrogen. Only the lower members are odourless, flammable gases, the middle are mostly petroleum and mineral oil-type liquids and the higher members solids. Hydrocarbons are mostly recognizable even in small quantities by their typical smell.

Hydrocarbon emissions are derived mainly from the industrial sector (especially from industrial processes, as evaporating solvents and cleansing agents, and from furnaces).

Road traffic, followed by the domestic sector, is the second-largest source of man-made HC emissions.

Figure 26 gives total HC emissions for those Member States for which data was available for 1970 to 1986. Data for the USA has been added for comparison.

Figure 26: Trend in HC emissions (in 1000 t)

	1970	1975	1980	1985	1986
FRG	2 615	2 545	2 486	2 371	2 426
Ireland	-	48	62	64	-
Italy	1 525	-	696	737	767
Netherlands	546	549	493	472	470
UK	1 993	2 090	2 241	2 278	2 321
USA	27 200	22 800	23 000	20 300	19 500

Source: OECD Report, p.29

3.2.5 Carbon dioxide

Figure 27 shows CO_2 emissions from the combustion of fossil fuels (gas, solid, liquid) in the Member States from 1960 to 1987 in 1m t. carbon. Figures for the USA and Japan have been added for comparison.

Figure 27: Carbon dioxide emissions 1960-1987 (in 1m tonnes)

	1960	1970	1980	1985	1986	1987
Belgium	21 792	33 535	34 821	27 931	28 678	28 582
Denmark	7 576	16 080	16 778	16 907	16 694	16 665
FRG	138 950	197 258	212 120	206 915	204 308	201 195
Greece	2 321	5 899	12 640	15 220	15 294	16 310
Spain	12 644	27 922	54 870	50 665	49 837	49 930
France	68 436	110 418	129 470	102 761	98 748	99 991
Ireland	2 607	4 810	6 706	7 227	7 632	8 107
Italy	26 442	77 642	97 818	94 208	94 149	101 378
Luxembourg	3 337	3 776	3 098	2 562	2 505	2 406
Netherlands	18 837	35 278	43 400	40 606	42 320	43 592
Portugal	2 085	3 399	7 005	7 036	7 844	7 764
UK	162 870	178 794	158 663	152 878	157 228	160 254
USA	783 649	1 149 328	1 248 174	1 190 287	1 191 398	1 213 930
Japan	60 842	194 666	242 898	244 238	241 202	241 453

Source: EUROSTAT

At present carbon dioxide accounts for more than 50% of the greenhouse effect. In addition to the levels of energy used, the type of energy is very significant as far as CO_2 emissions are concerned.

The highest CO_2 emissions per unit of energy are produced by the combustion of brown and hard coal (121 and 100). CO_2 emissions per unit of energy are 88 for oil and the lowest CO_2 emissions occur during the combustion of natural gases (58).

Oil is in the middle of the range. For this reason the rate of increase of CO_2 emissions in the periods during which the proportion of oil or natural gas increases is lower than the rate of increase for the energy used in combustion processes.

These tables do not include the CO_2 emissions from the use of the biomass (e.g. wood and dung) for energy purposes and from the burning of the tropical rain forests. The percentage of CO_2 emissions from burning in forests in relation to CO_2 emissions derived from the combustion of fossil fuels is estimated between 27% and 32%. The percentage of CO_2 emissions from the use of biomass for heating and cooking cannot yet be established[1].

Figure 28 gives the absolute figures for CO_2 emissions, by sector and type of fuel for EUR 12 for 1980 to 2010.

<u>Figure 28</u>: Trend in CO_2 emissions for EUR 12 (in 1000 t)

	1980	1986	1990	1995	2000	2010
<u>Power generation</u>	870 700	786 414	871 576	966 047	1 085 234	1 202 582
Solid fuels	568 405	590 119	658 290	711 397	846 418	1 032 470
Oil	201 917	107 226	137 521	164 430	151 724	59 896
Gas	100 378	89 069	75 765	90 219	87 092	110 216
<u>Other transformations</u>	0	0	0	0	0	0
Solid fuels	0	0	0	0	0	0
Oil	0	0	0	0	0	0
Gas	0	0	0	0	0	0
<u>Energy sector</u>	124 039	93 320	83 964	90 312	88 356	86 781
Solid fuels	4 979	3 228	1 887	1 723	1 518	1 108
Oil	89 445	63 422	75 903	81 744	79 569	78 780
Gas	29 615	26 669	6 173	6 844	7 269	6 892
<u>Industry</u>	626 593	496 479	528 143	533 090	531 647	553 113
Solid fuels	159 401	167 994	154 252	155 214	154 646	162 699
Oil	272 239	157 687	157 785	155 482	145 579	138 951
Gas	194 954	170 798	216 106	222 394	231 422	251 462

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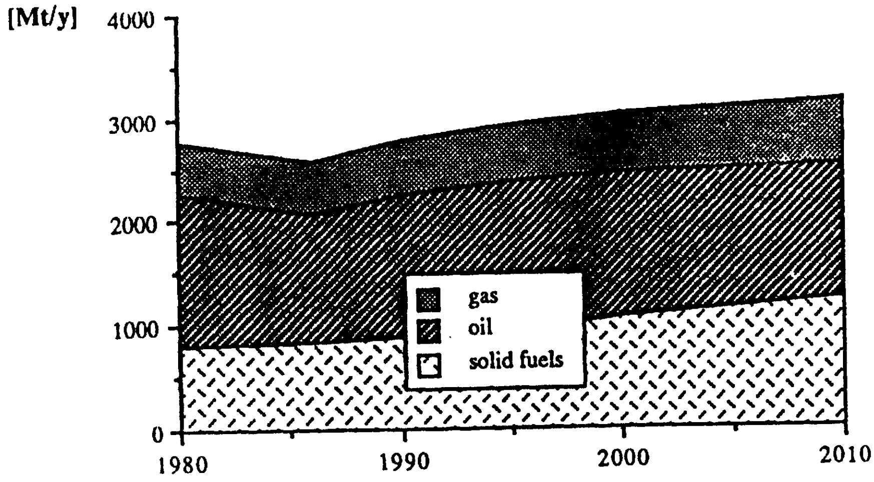
1 Source: UBA Report 88/89, p.21

Residential/Commercial	620 223	606 715	611 449	611 403	582 750	547 187
Solid fuels	78 012	68 945	66 579	57 749	45 483	36 300
Oil	382 834	338 947	321 836	312 634	282 242	238 003
Gas	159 377	198 824	223 034	241 020	255 025	277 883
Transport	514 947	577 527	671 616	715 134	739 746	760 891
Solid fuels	0	0	0	0	0	0
Oil	514 947	577 527	671.616	715 134	739 746	760 891
Gas	0	0	0	0	0	0
Total	2 756 502	2 560 455	2 766 748	2 915 986	3 027 732	3 150 552
Solid fuels	810 797	830 286	881 008	926 083	1 048 065	1 232 577
Oil	1 461 381	1 244 810	1 364 661	1 429 425	1 398 860	1 276 521
Gas	484 323	485 359	521 078	560 478	580 808	641 453

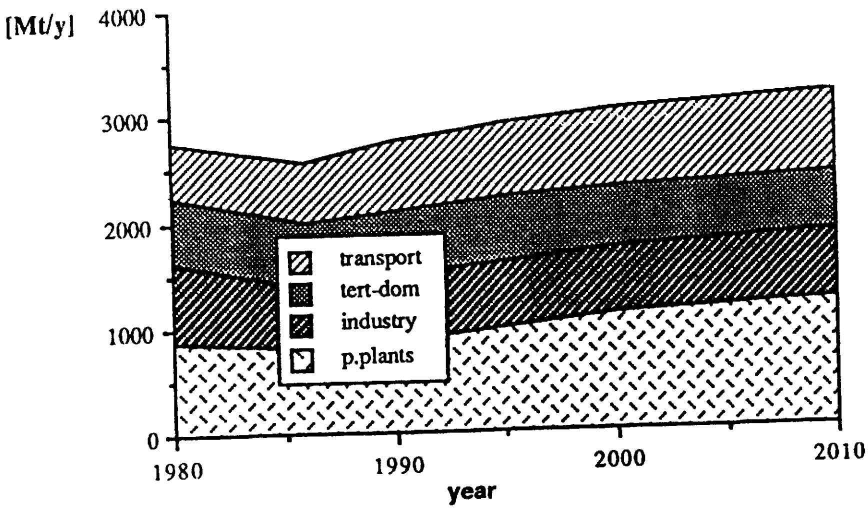
Source: COM(89) 369 final

Figure 29 shows CO_2 emissions from the combustion of fossil fuels for EUR 12, by fuel (1980 - 2010)



Source: COM(89) 369 final

Figure 30 shows CO_2 emissions for the 12 Member States from the combustion of fossil fuels, divided by sector (1980-2010)



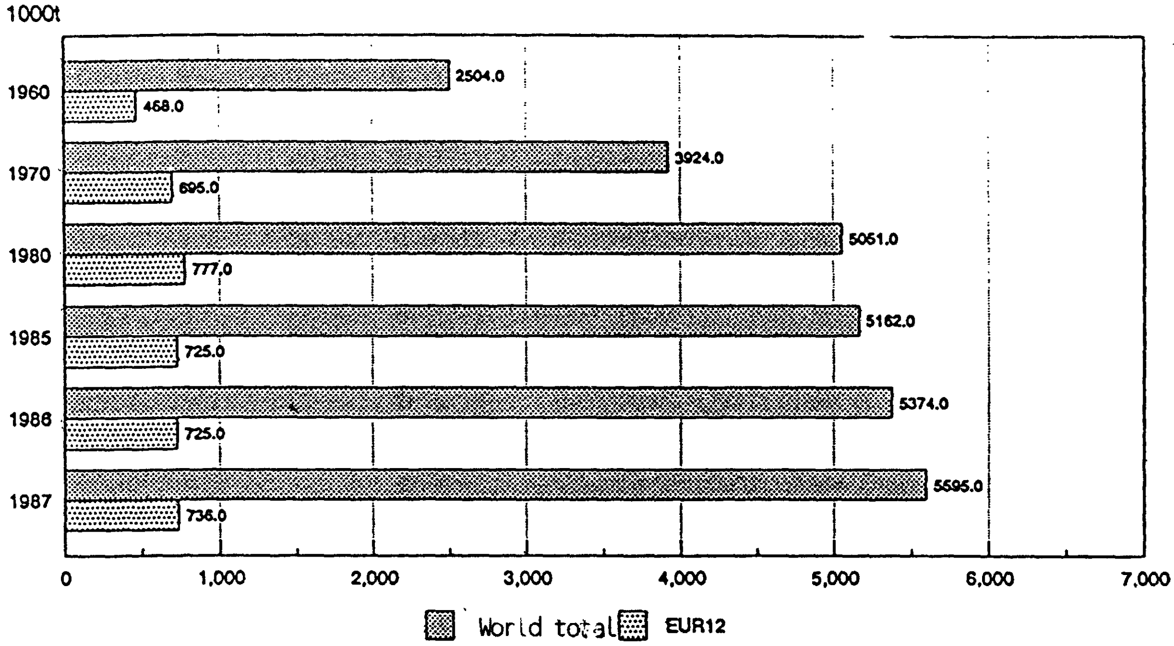
Source: COM(89) 369 final

Throughout the world the absolute quantities of CO_2 emissions from fossil fuels have risen constantly since 1960. Total emissions of CO_2 from the EC Member States reached their maximum in 1980 and then fell until 1983, since when there has been a tendency for them to rise. By contrast the Community's share in worldwide CO_2 emissions from fossil fuels has fallen constantly since 1960. Reasons for the increase in carbon dioxide emissions are the increasing industrialization of the Third World countries, the reduction in tropical rain forests and the constant increase in the use of nuclear energy during this period.

Figure 31 shows the world trends in CO_2 emissions from fossil fuels.

Figure 31: Carbon dioxide emissions worldwide and for the EC 1960-1987

WORLD AND EC CARBON DIOXIDE EMISSIONS
1960-1987
(1000 t)



Source: EUROSTAT

Recommendations were made at the world climate conference in Toronto in 1988 that CO_2 emissions should be cut globally by 20% by the year 2005 and by at least 50% by 2050.

At present industrialized countries generate 60% of the world's CO_2 emissions and these states were recommended to reduce their CO_2 emissions by at least 80% by the middle of the next century.

Alongside these recommendations it must be pointed out that because of population growth and the lack of alternative sources of energy there will be an increase rather than a decrease in the use of fossil fuels in the developing and newly industrialized countries and thus a further increase in CO_2 emissions which exacerbate the greenhouse effect.

4. Waste

4.1 General

Changes in the economic and social structure, altered living habits, increased production, the use of non-durable goods, more and bulkier packaging and the increase in disposable products has led to a massive increase in wase in recent years.

The problem of waste raises various questions, including the main methods of disposal (recycling, incineration and dumping), rules for the transport of waste in the large internal market and rules for exports to third countries, etc.. The responses to such questions have direct consequences for the economy and the environment. At present in the majority of cases economic rather than environmental considerations are the key factors in the movement of waste in the Member States[2].

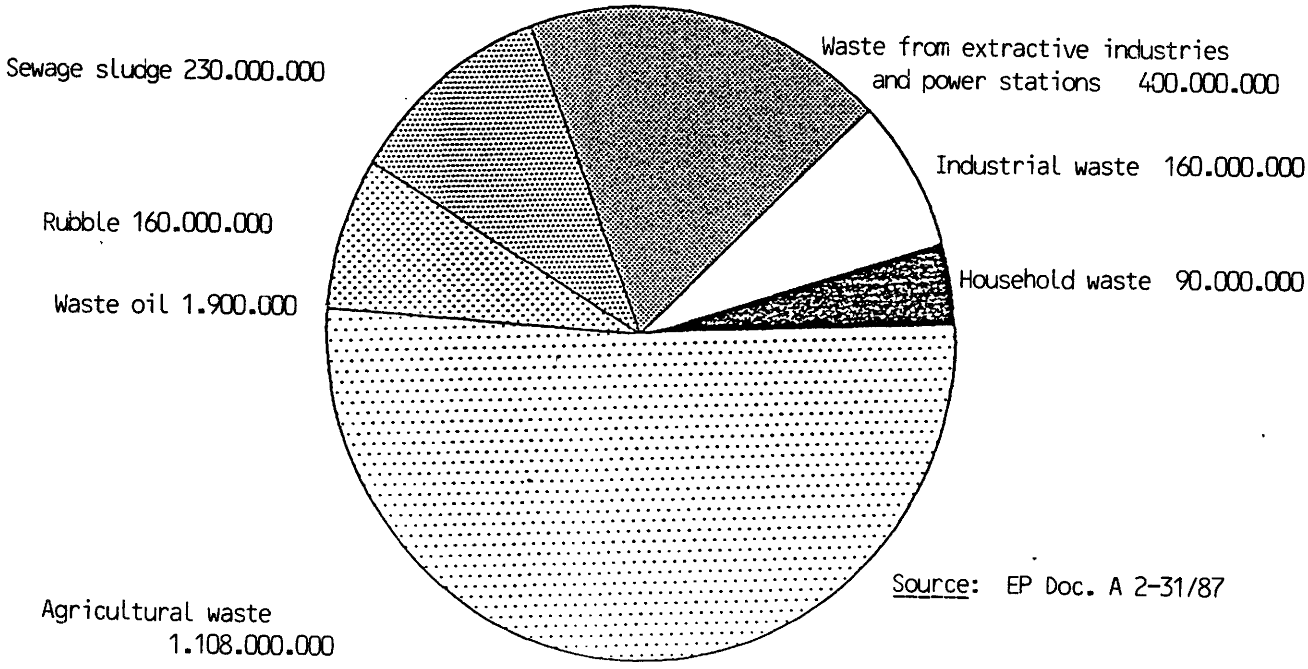
The fact that each year large quantities of waste from the Community are exported (waste incinerated and dumped at sea as well as waste for dumping in non-Member States) raises as many problems as the feasibility of implementing policies on disposal plants in the Community.

4.2 Waste generated in the EC

It is extremely difficult to give exact figures for the waste generated in the Community, in particular as Member States do not use uniform terminology.

Figure 32 gives estimates of the waste generated annually in the Community (tonnes per year). Total waste: ca. 2 000 000 000

TOTAL TONNES OF WASTE PRODUCED PER YEAR



Source: EP Doc. A 2-31/87

[2]SEC(89) 934 final. Communication from the Commission to the Council and to Parliament 'A Community strategy for waste management'.

4.3 Municipal waste

Municipal waste includes waste paper and cardboard, glass, batteries, compostable kitchen and garden waste, metals in general, aluminium, tins, edible oils and mineral oils, textiles, medicines, paint waste, solvents, plastics, etc.

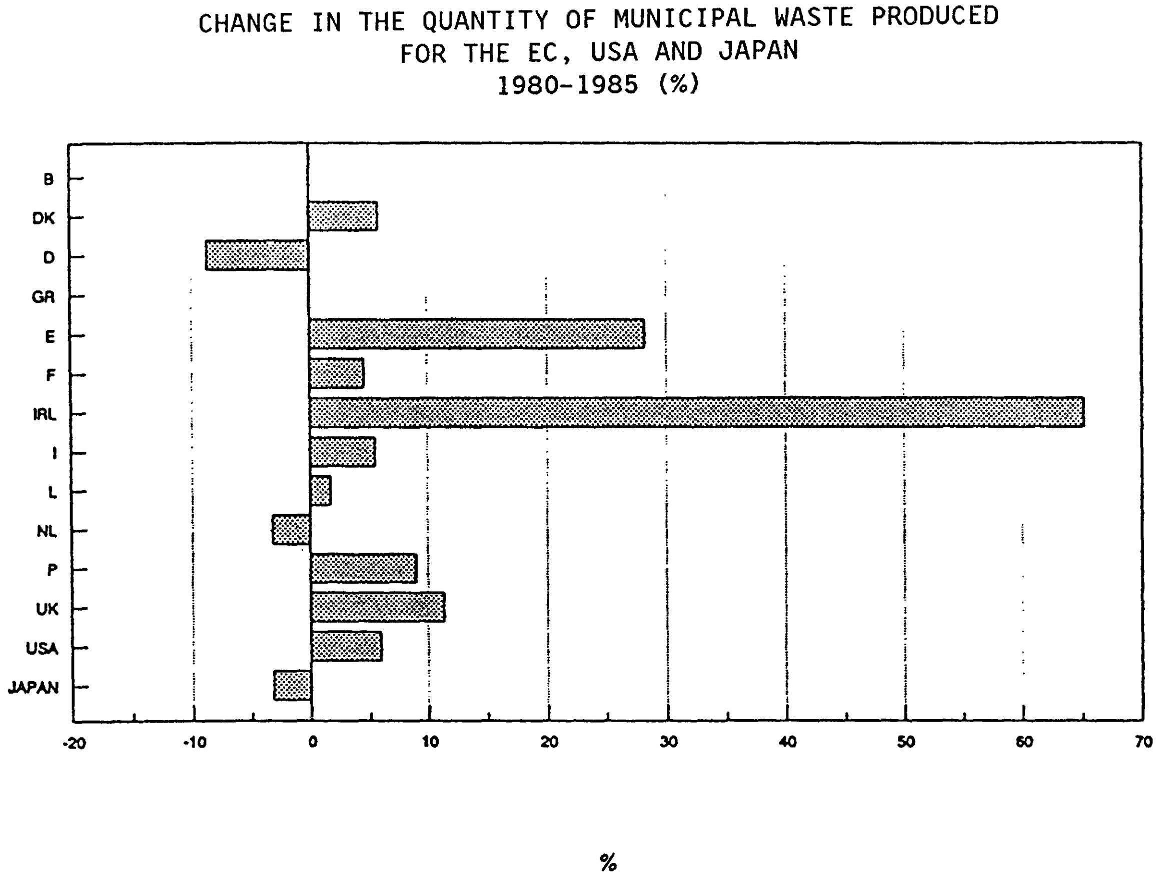
Figure 33 gives figures for the amount of municipal waste produced in the Community's Member States, the GDR, USA and Japan for 1975 to 1985 (in tonnes).

	Quantity		1.000 t	% growth		Waste per capita		
	1975	1980	1985	75-80	80-85	1975	1980	1985
Belgium	2 900	3 082	:	6,3	:	296	313	:
Denmark	:	2 046	2 161	:	5,6	:	399	423
FRG	20 423	21 417	19 387	4,9	-9,5	330	348	318
Greece	:	2 500	:	:	:	:	259	:
Spain	:	8 028	10 600	:	32,0	:	215	275
France	:	14 000	15 000	:	7,1	:	260	272
Ireland	555	640	1 100	15,3	71,9	175	188	311
Italy	14 095	14 041	15 000	-0,4	6,8	254	249	263
Luxembourg	119	128	131	7,6	2,3	330	351	357
Netherlands	:	6 565	6 510	:	-0,8	:	464	449
Portugal	:	1 984	2 246	:	13,2	:	203	221
U.K.	16 036	15 816	17 737	-1,4	12,1	324	319	355
USA	140 000	160 000	178 000	14,3	11,3	648	703	744
Japan	38 074	41 511	41 530	9,0	0,0	341	355	344

Source: EUROSTAT

The diagram below shows the percentage change in the quantity of municipal waste for the Community Member States, the USA and Japan.

Figure 33a:



Source: EUROSTAT

The reduction in the municipal waste produced per person in the Federal Republic and the Netherlands between 1980 and 1985 is due to the increased use of separate collection of materials such as glass and paper.

The reduction in the absolute quantity of municipal waste is often associated with an increase in the volume of waste, mainly because of light but bulky packaging material. Thus the volume of waste in the Federal Republic increased between 1980 (123 989 m.m^3) and 1984 (137 453 m.m^3), while the absolute quantity fell during this period.

Figure 34 indicates the composition of municipal waste.

Figure 34: Composition of municipal waste

	Paper and cardboard			Plastics			Glass			Metals			Other		
	1975	1980	1985	1975	1980	1985	1975	1980	1985	1975	1980	1985	1975	1980	1985
Belgium	30,0	35,0	:	5,0	5,8	:	8,0	8,2	:	4,5	5,1	:	51,5	45,9	:
Denmark	35,0	34,0	:	4,0	7,0	:	8,0	6,0	:	4,0	5,0	:	49,0	47,0	:
FRG	25,0	19,9	17,9	8,0	6,1	5,4	15,0	11,6	9,2	5,0	3,9	3,2	47,0	58,5	64,3
Greece	:	19,6	:	:	7,0	:	:	2,7	:	:	4,2	:	:	66,5	:
Spain	:	15,0	15,0	:	6,0	6,0	:	6,0	6,0	:	2,5	2,5	:	70,5	70,5
France	35,0	28,0	27,5	5,0	6,0	4,5	8,0	11,0	7,5	5,0	5,0	6,5	:	50,0	54,0
Ireland	33,0	35,0	24,5	4,0	11,0	14,0	8,0	8,0	7,5	4,0	3,0	3,0	51,0	43,0	51,0
Italy	20,4	22,5	22,3	5,3	6,8	7,2	6,4	6,7	6,2	3,0	2,9	3,1	64,9	61,4	61,6
Luxembourg	25,0	:	17,2	4,5	:	6,4	5,0	:	7,2	3,5	:	2,6	62,0	:	66,6
Netherlands	23,0	21,0	22,8	5,6	6,5	6,8	12,0	11,9	7,2	3,3	3,1	3,4	56,1	57,5	59,8
Portugal	:	18,9	19,0	:	3,2	3,0	:	2,9	3,0	:	3,6	3,5	:	71,4	71,5
UK	30,0	29,0	:	4,0	7,0	:	10,0	10,0	:	8,0	8,0	:	48,0	46,0	:
USA	32,5	29,7	34,7	3,0	5,3	6,7	10,0	10,3	9,0	9,0	9,6	8,8	45,5	45,1	40,8
Japan	30,9	27,4	38,3	8,9	12,3	7,7	6,1	8,0	1,3	3,7	4,7	1,4	50,4	47,3	51,3

Source: EUROSTAT

Figure 35: Disposal of municipal waste

	Year	Mechanical sorting	Composting	Incineration	% energy rec.	landfill	% other
Belgium	1980	0	11	23	(29,9)	50	16
Denmark	1985	0	5	32	:	63	0
FRG	1984	:	2	28	:	69	1
Greece	1980	:	:	:	:	100	:
Spain	1986	0	19	5	(54,6)	76	:
France	1985	:	8	36	(63,5)	47	9
Ireland	1984	0	0	0	(0,0)	100	0
Italy	1985	3	6	20	(21,3)	38	33
Luxembourg	1985	0	0	78	(100,0)	22	0
Netherlands	1985	1	5	36	(71,0)	55	4
Portugal	1985	:	17	:	:	24	59
UK	1984	:		6	:	74	20
USA	1984	:	:	12	:	88	:
Japan	1986	:	0	72	:	25	3

Source: EUROSTAT

4.4 Recycling

The figure below indicates the amount of waste recycled as a percentage of the total quantity of waste produced.

Figure 36: % of recyclable materials

	Paper and cardboard			Glass			%
	1975	1980	1985	1975	1980	1985	1987
Belgium	8,7	14,7	:	:	33,0	42,0	39,0
Denmark	28,4	26,2	31,0	:	8,0	19,0	32,0
FRG	34,2	33,9	41,2	7,7	24,0	39,0	37,0
Greece	:	:	:	:	:	:	:
Spain	:	38,1	44,1	:	:	13,1	22,0
France	31,7	:	33,0	:	20,0	26,0	26,0
Ireland	22,0	15,0	:	:	8,0	7,0	8,0
Italy	:	:	:	:	20,0	25,0	38,0
Luxembourg	:	:	:	:	:	:	:
Netherlands	42,0	45,5	50,3	:	41,0	53,0	62,0
Portugal	:	38,0	:	:	:	10,0	14,0
UK	28,0	29,0	27,0	:	5,0	12,0	13,0
USA	15,4	:	20,0	2,9	:	8,0	:
Japan	39,6	48,1	49,6	:	35,3	47,2	54,4

Source: EUROSTAT

5. Forests

5.1 General

The importance of forests for life on earth is undisputed and the need for the world's forests to be preserved is based on their fundamental importance for the global ecosystem. Regardless of the fact that the individual types of woodland vary in terms of composition and structure, forests fulfil an environmental function, absorbing CO_2 from the atmosphere, producing oxygen (photosynthesis), regulating temperature, humidity and the water cycle and protecting the soil from erosion. The economic aspects of forests (timber industry, trade in various woods, tourism, etc.) and the social aspects (recreation) of this renewable resource are also important.

However it is not the last two points which make the question of the situation of forests so crucial, it is the link between forests and the environment as a whole.

Europe's forests are at risk mainly from air pollution (all of Europe) and forest fires (mainly in the Community's Mediterranean area). If the forecasts of an increasing number of researchers are to be believed, storms will become more frequent in western Europe because of the climatic changes caused by pollutants in the atmosphere. The change in wind conditions as a result of milder winters would then certainly become another serious cause of damage to forests.

In the Federal Republic about 250 000 ha of the 7.4 m ha of woodland were destroyed by the hurricanes in February and March 1990, i.e. about 1 billion plants. The damage caused by these storms in the forests of the Federal Republic amounted to 49.2 m m^3, in Luxembourg to 1.5 m m^3, in the Netherlands to 400 000 m^3, in France to 8.5 m m^3, in Belgium to 4 m m^3 and in the United Kingdom to 3 to 4 m m^3.

The subsequent problems of clearing and storing the fallen trees, the planting of new stands etc. require considerable efforts to be made.

It should also be noted that natural occurrences like disease, browsing, snow damage and drought can also cause damage to forests. According to current thinking the infestation of forests with microorganisms, fungi and viruses is an indication of their susceptibility to parasites.

Figure 37 shows trends with regard to forest area for the EC Member States for 1970 to 1986

<u>Figure 37:</u> Forest area for the EC Member States, 1970-1986 (in km^2)

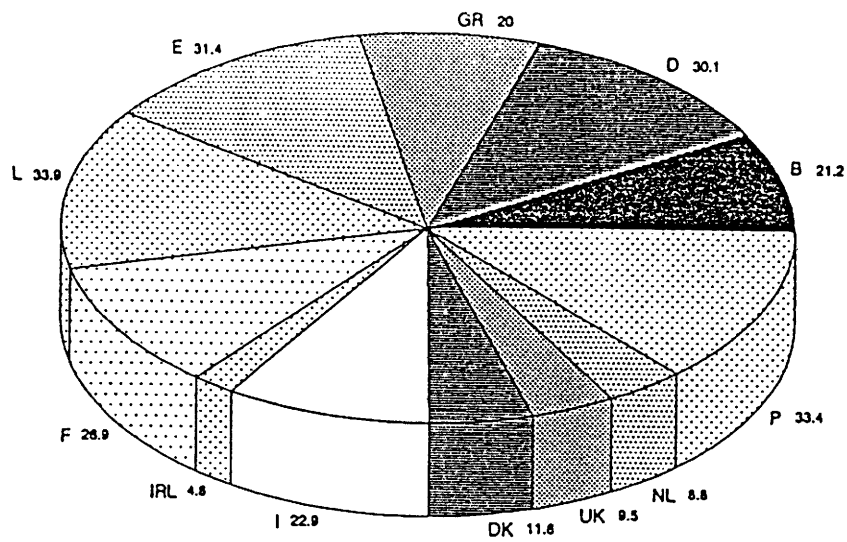
	1970	1980	1985	1986
Belgium[1]	6 200	6 130	6 184	6 950
Denmark	4 720	4 930	4 930	4 930
FRG	71 695	73 200	73 600	73 600
Greece[2]	26 100	26 190	26 200	26 210
Spain	143 860	155 980	156 142	156 753
France	140 130	148 634	151 266	146 200
Ireland	2 450	3 200	3 300	3 310
Luxembourg	826	821	886	879
Netherlands[3]	2 980	2 940	3 287	2 970
Portugal	30 419	30 633	30 599	30 599
UK	18 840	21 400	22 800	22 900
EC total	509 014	536 867	545 579	541 692
World total	41 906 640	41 119 100	40 866 360	40 866 360

[1] Belgium and Luxembourg
[2] Data only for enclosed woodland
[3] Data collection methods changed between 1970 and 1980

<u>Source:</u> OECD Report, p.113

Figure 38 indicates the percentage of woodland in the total area of the Member States.

WOODLAND AS A PERCENTAGE OF THE TOTAL AREA (1986)



5.2 Situation of forests

There is now general agreement that the direct and indirect effects of air pollution are the main cause of the widespread damage in Europe's forests and of the death of forests in Europe. It is accepted that sulphur dioxide, nitrogen compounds and the acids and photo-oxidants they produce in the air (including ozone) have a damaging effect. The effect of hydrocarbon compounds on the death of forests still requires further investigation.

The damage to forests occurring throughout the Community affects all aspects of the forest ecosystem. The damage can be observed in various types of terrain (mountains, coast, clean air zones), on a range of soils (chalk, acid etc.) and as affecting various species of tree (fir, oak, pine, beech etc.). Defoliation and the discoloration of leaves or needles are the easily recognizable signs.

Under Council Regulation (EEC) No. 3528/86 of 17 November 1986 on the protection of the Community's forests against atmospheric pollution the Member States have been required since 1987 to carry out surveys throughout the Community of damage to forests and to submit a report on damage to forests to the Commission each year.

Commission Regulation (EEC) No. 1696/87 contains a uniform procedure based on guidelines for the uniform collection, assessment and monitoring of data on the effects of air pollution.

In 1989 the Commission produced a report on the health of forests in the European Community, 1987-1988, which contains the results of the national reports on forest health and the Community survey of damage to forests for 1987 and 1988.

For the assessment of forest health the extent of damage is assessed using the five European damage classes:

- class 0 : not damaged (0-10%)
- class 1 : slightly damaged (11-25%)
- class 2 : moderately damaged (26-60%)
- class 3 : severely damaged (over 60%)
- class 4 : dead

The discoloration or defoliation is assessed on the basis of a tree with full foliage. Damage class 1 can be seen as an 'alarm' stage and the total percentage of classes 2, 3 and 4 allows a reliable assessment to be made of the existence of significant damage.

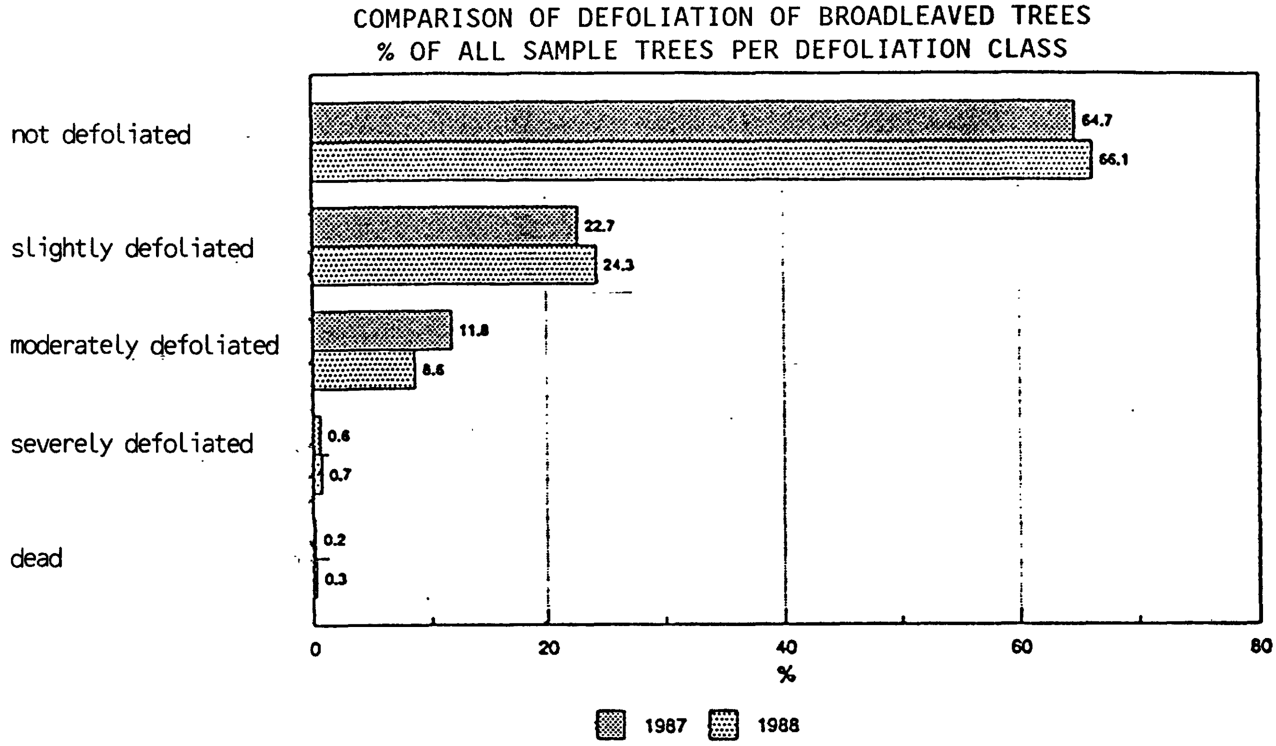
Figure 39 shows the trends for defoliation for all types of trees in the Community for 1987/1988. 19 651 sample trees were assessed.

	1987	1988
Defoliation class	% of trees	
not defoliated	58,67	57,72
slightly defoliated	26,57	29,42
moderately defoliated	13,56	11,39
severely defoliated	1,07	1,12
dead	0,12	0,35

Source: Report on forest health in the Community, 1987-1988, p.8

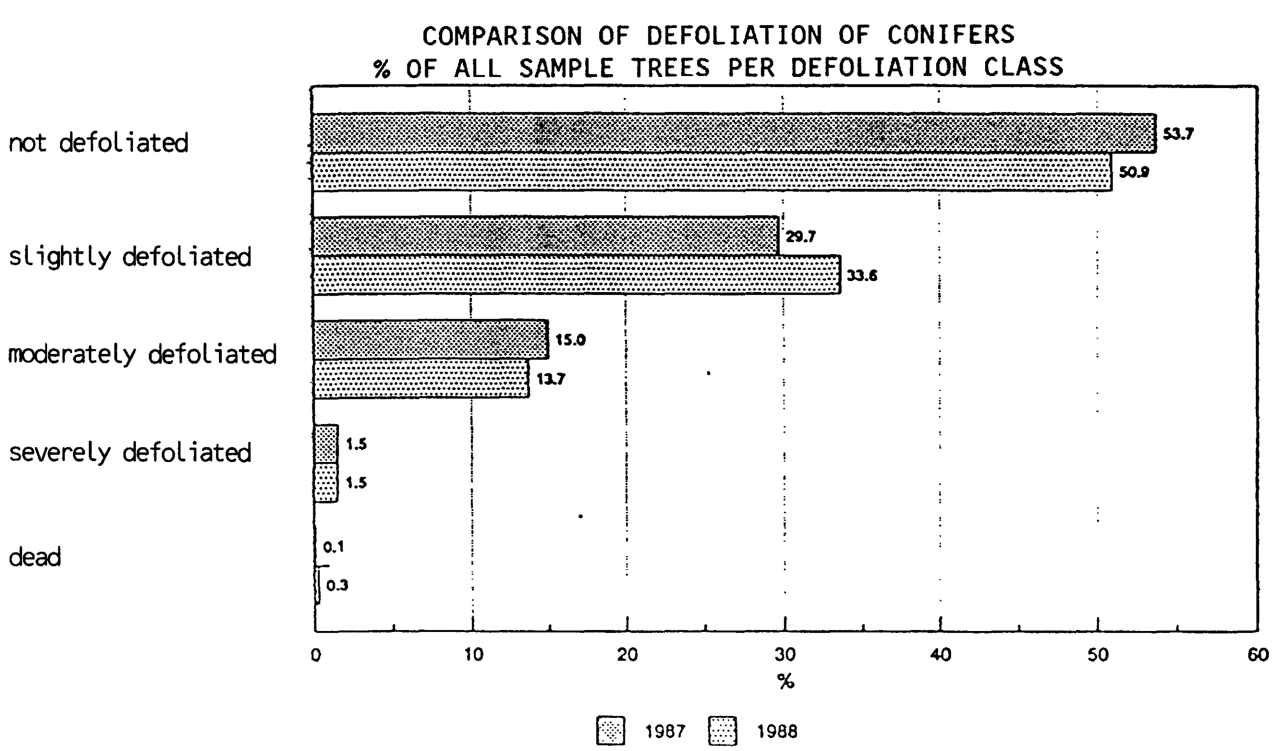
These figures indicate that the health of trees has deteriorated between 1987 and 1988. The percentage of all trees with 10% or less damage (class 0) has fallen between 1987 and 1988.

Figure 40 provides information on defoliation of broadleaved trees for 1987/1988.



Source: Report on forest health in the European Community, 1987-1988, p.12; DGIV (EP)

Figure 41 shows defoliation of conifers for 1987-1988.



Source: Report on forest health in the European Community, 1987-1988, p.12; DGIV (EP)

The bar charts show the percentages for all trees sampled for each defoliation class. For broadleaved trees the total of trees sampled was 8 809 and for conifers 10 842.

These diagrams show that more than one third of broadleaved trees are damaged (the percentage of broadleaved trees with more than 10% defoliation was 35.3% in 1987 and 33.9% in 1988). They also show that about half the conifers are damaged and that the health of conifers has deteriorated over these two years (the percentage of conifers with over 10% defoliation increased from 46.3% in 1987 to 49.1% in 1988).

Figure 42 shows the extent of damage for all types of trees in the Member States in 1988 (percentage in the various damage classes). The figures are based on national (n) or regional (r) surveys.

Figure 42: Situation of forests in the Member States of the Community (1988).

Member State	not damaged (class 0)	slightly to severely damaged (class 1-3)	moderately to severely damaged (class 2-4)
Belgium/ Wallonia (r)*	65,0	35,0	11,0
Denmark (n)	51,0	49,0	18,0
FRG (n)	47,6	52,4	14,9
Greece (n)	36,0	64,0	17,0
Spain (n)	68,6	31,4	7,0
France (n)	77,3	22,7	6,9
Ireland (n)*	69,9	30,1	4,8
Italy/ Tuscany (r)	48,9	51,1	18,7
Luxembourg (n)	57,6	42,4	10,3
Netherlands (n)	50,9	49,1	21,0
Portugal (n)	96,5	3,5	1,3
UK (n)	36,0	64,0	25,0

*conifers only

Source: UN ECE/JCP Forests (1989)

6. Energy

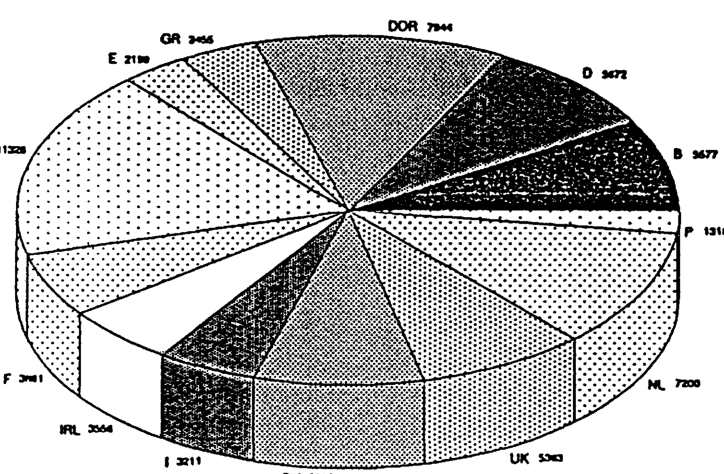
The production, use and transformation of energy harms the environment, involving air pollution, pollution of water, waste products, use of land and encroachment on the plant and animal world.

The diagrams which follow provide basic data on the air pollution (mainly through SO_2, NO_x, CO_2) caused by the use of energy. The trends shown in these diagrams in the use of energy from fossil fuels allow an analysis to be made of emissions of pollutants.

Fossil fuels contribute to the greenhouse gases - carbon dioxide (CO_2), methane (CH_4) and nitrogen oxide (NO_2). About 90% of the SO_2 and NO_x pollutants which are released as a result of human activity are related to the energy sector.

Figure 43 indicates the energy consumption per inhabitant of EUR 12 and the GDR for 1987.

ENERGY CONSUMPTION (coal unit)
kg. per person (1987)

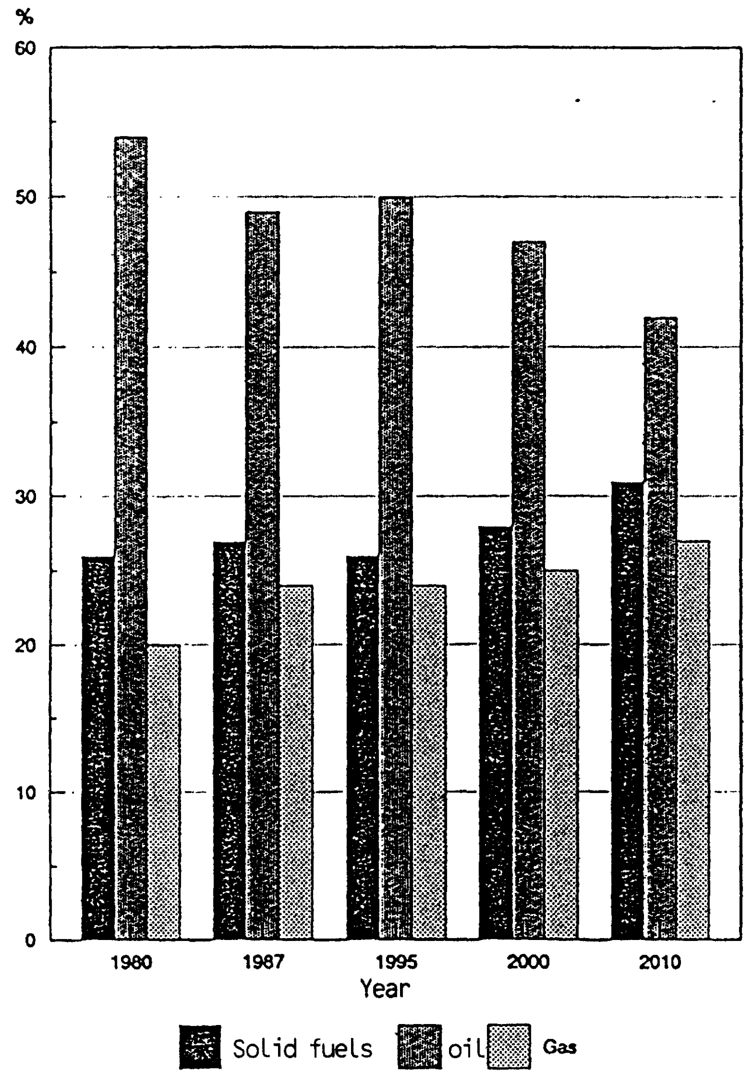


Source: Statistisches Jahrbuch 1989 für das Ausland, Federal Statistical Office, FRG, 12/89
EUROSTAT: Basic Statistics 1989

Figure 44 shows the probable trend in the use of fossil fuels in the Community.

FOSSIL FUELS FOR COMBUSTION PURPOSES
IN THE COMMUNITY

m t. oil equivalent



Source: COM(89) 369 final

Figure 45 shows the consumption of fossil fuels for combustion purposes by sector.

Figure 45: Consumption of fossil fuels for combustion purposes
Survey by sectors

m toe	1980	1987	1995	2000	2010
Power generation	243,8	211,5	259,3	287,4	319,0
Solid fuels	140,5	146,3	170,8	203,0	250,8
Oil	71,1	36,3	55,3	46,5	21,0
Gas	32,2	28,9	33,2	37,9	47,2
Other transformations	36,4	27,8	27,7	25,8	24,6
Solid fuels	30,2	24,7	23,4	21,9	21,7
Oil	6,2	3,1	4,3	3,9	2,9
Gas	0	0	0	0	0
Energy sector	45,7	40,3	39,5	39,4	37,9
Solid fuels	1,3	0,6	0,6	0,5	0,8
Oil	33,9	28,3	29,9	29,5	27,5
Gas	10,5	11,4	9,0	9,4	9,6
Industry	195,4	159,1	170,2	170,2	177,2
Solid fuels	41,1	40,8	38,1	37,9	39,7
Oil	90,9	50,3	54,1	51,4	49,5
Gas	63,4	68,0	78,0	80,9	88,0
Residential/commerce	223,8	221,3	232,9	227,3	219,2
Solid fuels	21,6	17,3	13,9	11,5	9,2
Oil	124,9	105,4	103,7	93,8	79,3
Gas	77,3	98,6	115,3	122,0	130,7
Transport	167,8	195,9	233,0	240,9	247,5
Solid fuels	0,2	0,1	0,1	0,1	0
Oil	167,4	195,6	232,7	240,6	247,3
Gas	0,2	0,2	0,2	0,2	0,2
TOTAL	912,9	855,9	962,6	991,0	1025,4

Source: COM(89) 369 final

Figure 46 indicates the absolute quantities (in m toe) of natural gas used by the individual Community Member States to cover the primary energy requirement for the period 1960-1987. For 1987 the percentage of natural gas in total primary energy consumption is also given.

Figure 46: Primary energy requirement - natural gas

	1960	1970	1980	1985	1986	Mtoe 1987	% 1987
	----	----	----	----	----	----	----
B	54	3 417	8 911	7 328	6 530	7 312	14,9
DK	0	0	0	566	1 029	1 306	8,0
BRD	656	12 668	44 689	41 234	41 034	45 491	20,6
GR			0	71	98	112	0,5
E			1 743	2 352	2 554	2 855	3,8
F	2 404	8 212	21 571	24 271	24 336	25 119	13,7
IR	0	0	737	1 946	1 359	1 343	20,7
I	5 279	10 607	22 728	27 196	28 883	32 068	23,1
L	0	11	424	303	302	345	13,1
NL	283	15 402	30 417	32 325	32 530	33 618	38,5
P	0	0	0	0	0	0	0,0
UK	66	10 172	39 886	47 106	48 180	49 308	22,6
DDR							1988: 11,4

Figure 47 shows the absolute quantities (in m toe) of liquid fuels used by the individual Community Member States to cover the primary energy requirement for the period 1960-1987. The percentage of liquid fuels in the total primary energy requirement for 1987 is given in the right hand column.

Figure 47: Primary energy requirement: liquid fuels

	1960	1970	1980	1985	1986	Mtoe 1987	% 1987
	----	----	----	----	----	----	----
B	6 704	24 022	22 890	17 451	19 400	23 660	48,3
DK	4 828	18 099	13 231	10 659	10 479	7 109	43,3
BRD	31 560	125 524	128 864	108 848	114 130	64 629	29,3
GR			11 568	11 016	10 370	14 458	65,5
E			49 292	38 112	38 342	39 881	52,8
F	27 644	91 755	109 151	84 243	84 668	70 320	38,4
IR	1 168	3 971	5 624	4 161	4 789	1 433	22,1
I	21 218	81 622	92 870	80 477	81 593	76 946	55,3
L	220	1 306	1 099	1 057	1 150	1 300	49,3
NL	10 885	28 554	29 141	20 835	23 130	44 711	51,2
P			8 256	8 417	9 030	8 773	66,5
UK	44 053	97 944	79 378	77 525	76 975	83 653	38,4
DDR							1988: 11,5

Source: EUROSTAT
For the GDR: IÖW 36/90

Figure 48 shows the absolute quantities (in m toe) of electricity imports and exports made by the individual Member States during the period 1960-1987. (Imports (+), exports (-).

Figure 48: Primary energy requirement: electricity imports-exports

	1960	1970	1980	1985	1986	Mtoe 1987	% 1987
B	10	83	-590	-10	-47	-473	-1,0
DK	23	-938	-275	101	18	540	3,3
BRD	930	1 730	1 286	558	1 177	847	0,4
GR			138	166	283	138	0,6
E			-309	-239	-281	-343	-0,5
F	-21	-114	691	-5 218	-5 688	-6 634	-3,6
IR	0	0	0	0	0	0	0,0
I	-29	886	1 358	5 286	4 940	5 169	3,7
L	3	345	634	792	779	795	30,1
NL	26	-75	-70	1 145	486	810	0,9
P			408	504	421	675	5,1
UK	0	122	0	0	951	2 600	1,2

Source: EUROSTAT

Figure 49 shows the absolute quantities (in m toe) of hydroelectric power generated and used to cover the primary energy requirement in the period 1960-1987. Figures are also given for the percentage of hydroelectric energy used in the total primary energy requirement of these Member States in 1987.

Figure 49: Primary energy requirement: hydroelectric energy

	1960	1970	1980	1985	1986	Mtoe 1987	% 1987
B	39	55	62	62	78	96	0,2
DK	5	5	8	21	36	47	0,3
BRD	2 706	3 655	3 881	3 470	3 722	4 119	1,9
GR			761	626	722	621	2,8
E			6 600	6 982	5 919	6 081	8,0
F	9 114	12 745	15 678	13 964	14 582	16 294	8,9
IR	221	179	187	184	205	153	2,4
I	10 236	9 016	10 106	9 177	9 179	8 826	6,3
L	5	21	21	18	18	23	0,9
NL	0	0	0	0	0	0	0,0
P			1 790	2 403	1 909	2 047	15,5
UK	699	1 013	878	914	1 029	901	0,4

Source: EUROSTAT

Figure 50 shows the absolute quantities (in m toe) of geothermal energy used in the Member States for the primary energy requirement in the period 1960-1987. The percentage of geothermal energy in the total primary energy requirement in these Member States is included for 1987.

Figure 50: Primary energy requirement: geothermal energy

	1960	1970	1980	1985	1986	Mtoe 1987	% 1987
	----	----	----	----	----	----	----
B	0	0	0	0	0	0	0,0
DK	0	0	0	0	0	0	0,0
BRD	0	0	0	0	0	0	0,0
GR			0	0	0	0	0,0
E			0	0	0	0	0,0
F	0	0	0	0	0	0	0,0
IR	0	0	0	0	0	0	0,0
I	1 641	2 125	2 084	2 091	2 158	2 337	1,7
L	0	0	0	0	0	0	0,0
NL	0	0	0	0	0	0	0,0
P			0	0	0	0	0,0
UK	0	0	0	0	0	0	0,0

Source: EUROSTAT

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