Commission of the European Communities

environment and quality of life

THE MACROECONOMIC IMPACTS OF THE EC LARGE COMBUSTION PLANTS DIRECTIVE PROPOSAL

Technical Document I: Assessment of investments, costs and emission reduction

Technical Document II: INTERLINK: modification and detailed results

Volume II

Report

EUR 11662 EN

Blow-up from microfiche original

Commission of the European Communities

environment and quality of life

THE MACROECONOMIC IMPACTS OF THE EC LARGE COMBUSTION PLANTS DIRECTIVE PROPOSAL

Technical Document I: Assessment of investments, costs and emission reduction

Technical Document II: INTERLINK: modification and detailed results

Volume II

G. KLAASSEN (IVM), P. KEE (IVM), A. NENTJES (RUG),
W. HAFKAMP (IVM), A.A. OLSTHOORN (IVM)

Institute for Environmental Studies (IVM)
Vrije Universiteit
P.O. Box 7161
1007 MC AMSTERDAM

In association with:
State University Groningen (RUG)

Contract No. 86-B6642-11-003-11-N

SEPARATE APPENDIX OF FINAL REPORT

Directorate-General Environment, Consumer Protection and Nuclear Safety

1988

EUR 11662 EN

Published by the
COMMISSION OF THE EUROPEAN COMMUNITIES

Directorate-General
Telecommunications, Information Industries and Innovation

L-2920
LUXEMBOURG

LEGAL NOTICE

ABSTRACT

This study assesses the costs and ensuing macroeconomic impacts of the proposed Directive on large combustion plants for each EC country including proposals made up to the end of 1986.

The study focusses on macroeconomic indicators such as gross domestic product or GDP (value of total production within a country), employment, private consumption, current balance of payments account, consumer prices and the balance of government budget (revenue less expenditures).

In addition to interactions within the separate national economies, analysis of the interdependancies between them is examined by the use of an international model.

VOLUME 2 contains the Technical Document I: "Assessment of Investments, costs and emission reduction" and Technical Document II: "INTERLINK - modification and detailed results".

TECHNICAL DOCUMENT I:

ASSESSMENT OF INVESTMENTS, COSTS AND EMISSION REDUCTION

CONTENTS

page nr.

1. INTRODUCTION

This technical document provides background information on the main report of a study entitled 'The macroeconomic impacts of the EC large combustion plants Directive proposal'. This document focuses on the assessment of costs, investments and reduction in SO_2 and NO_X emissions, in each EC country, of the proposed Directive.
The Directive on large combustion plants, as proposed by the Commission consists of two elements:

1. Emission standards for new, large combustion plants;
2. A bubble concept, according to which member states are to reduce the total emissions of large combustion plants in 1995 with a certain percentage (using 1980 as a base year).

In order to assess the costs of the Directive one has to assess the volume of emissions to be abated to meet the requirements of the Directive. To fulfill that aim information is necessary on:

- the emissions of large combustion plants in 1980 since percentage reductions stipulated in the Directive use 1980 as a base year;
- the volume of unabated emissions of large combustion plants (LCPs) in 1995;
- the capacity and size distribution of new large combustion plants, due to come on stream before 1995, which are to meet the emission standards of the Directive.

In collecting the information the following complications arose:

- no firm nor complete database was available on the amount of fuel used in large combustion plants in 1980 and in 1995. Hence no straightforward projection of future emissions of large combustion plants in 1980 was possible;
- insufficient data on the size distribution of new, large industrial combustion plants were available to assess the costs of emissions standards, proposed in the Directive, for this category of new LCPs;
- several member states, Denmark, the Federal Republic of Germany and the Netherlands, already accepted legislation to control acidifying emissions, such as the SO_2 and NO_X emissions from LCPs.

Section 2 (the Directive on large combustion plants) of this technical document describes the Directive and presents the assumptions, reflecting discussions late 1986 in the Council, on the percentage reduction in each country.
The way the complications were tackled is described in section 3 (emissions of large combustion plants to be abated to meet the Directive in 1995).
Section 4 (costs module) describes the costs of the different abatement techniques distinguished and the country specific, and generic factors, used to calculate the abatement costs in each country.
Section 5 describes the abatement measures of the national legislation in Denmark, the Federal Republic of Germany, and the Netherlands.
The resulting calculation of abatement costs for each EC country is presented in due detail in section 6.
Section 7 contains a tentative assessment of the costs of the emission standards for new industrial plants. The same section also explains what the impact of this estimate is a sensitivity analysis, on the percepted costs of meeting both parts of the Directive: the emissions standards for all large plants and the bubble concept.
In section 8 some data are given on the annual abatement costs as percentage of the gross domestic product in each EC country. Furthermore the section assesses the impact on the average electricity production costs and the possible impact on the electricity price for large scale industrial use.
Full data on fuel use and emission factors are presented in the Annex to this document.

2. THE DIRECTIVE ON LARGE COMBUSTION PLANTS

2.1. Contents

The Commission of the Eurpean Community has proposed a Directive to limit SO_2 and NO_x emissions from large combustion plants (CEC, 1984b; CEC, 1985; European Com. Com., 1984). This draft Council Directive applies to combustion plants with a rated heat input equal to, or greater than 50 MW_{th}. The Directive consists of two components:

1. New plants (plants for which an operating license is granted after 1st. January 1985) have to comply with emission standards (see table 2.1). For installations smaller than 100 MW_{th} the date of implementation will be deferred five years. Emission standards also apply to extensions of existing plants and substantial alterations of plants using a multifuel firing system.
2. A bubble concept according to which member states are to draw up programmes for the reduction of total annual emissions from large combustion plants, in order to reach by 31st December 1995 at the latest, the following overall reductions of emissions from large combustion plants:
   60% for SO_2
   40% for NO_x (using 1980 as a base year).

Presently within the Council discussions are taking place on the contents of the Directive which have not yet resulted in a 'final' solution. For the purpose of this study the following assumptions have tentatively been made:

* The emission standards proposed for the first stage (1.1.1985 - 31.12.1995) are the same as those in the original proposal. For the second stage (after 31.12.1995) the Commission is to formulate new proposals.
* For the bubble concept a two stage approach will be adopted:
  stage 1 up to 1995 (maybe 1993)
  stage 2 up to 2000 (maybe 1998).
* In the first stage the basic aim is to reduce emissions from large combustion plants for the Community as a whole,
  with at least 45% for SO_2,
  with at least 30% for NO_x (both with respect to 1980 levels).

* In principle each EC country is to reach a minimum reduction of 45 % for SO_2 and 30% for NO_x with the following exceptions:
  For SO_2 as well as NO_x, Ireland and Luxemburg are to maintain their 1980 emissions (standstill) and Spain is to reduce emissions by at least 10%. Greece is allowed a standstill for its SO_2 emissions; Portugal for its NO_x emissions. Greece is granted an increase in its NO_x emissions whereas Portugal is to maintain SO_2 emissions at the 1980 level.
* In the second stage the basic aim is to reduce emissions from large combustion plants for the Community as a whole by at least
  60% for SO_2
  40% for NO_x (with respect to 1980 levels).
* In principle each country is to reach a minimum reduction of 60% for SO_2 and 40% for NO_x in stage 2.

Table 2.1. Emission limit values for large combustion plants.

Type of fuel	Plant size MWth	Emission limit values in mgr/Nm3 for			
		Sulphurdioxide[1])		Nitrogenoxides[2])	
		1-1-1985	31-12-1995	1-1-1985	31-12-1995
Solids	> 300	400[3])	250[4])	650[3])	200[4])
	100-300	1,200	1,200[4])	800	200[4])
	< 100	2,000	2,000[4])	800	400[4])[5])
Liquid	> 300	400	250	450	150
	100-300	1,700	1,700	450	150
	< 100	1,700	1,700	450	150
Gaseous	> 300	35 as a rule but 100		350	100
	100-300	for coke oven gas and		350	100
	< 100	5 for liquified gas		350	100

[1]) Account should be taken of the proportion of sulphur trioxide in the waste gases.

[2]) Expressed in terms of nitrogen dioxide. Nitrogen dioxide need not to be measured continuously if it accounts for less than 5% of total nitrogenoxides.

[3]) This limit value applies to all fluidised bed plants irrespective of thermal capacity.

[4]) Liquid and gaseous fuels 3% oxygen content by volume in the waste gasses. For solid fuels 6% oxygen content by volume in the waste gasses.

[5]) 400 as a rule but 800 for pulverised hard coal firing with extraction of fused ash.

Table 2.2. supplies an assessment of the possible abatement measures to comply with the emission standards. The assessment is based on a general transformation limit standards, expressed in mgr/Nm³ into gram/GJ. One should realise that this transformation, and thus the necessary abatement technique, depends very much on the fuel characteristics which may vary within and among countries.

Table 2.2. Emission limit values for new large combustion plants and possible measures.

Type of fuel	Plant size	Sulphurdioxide		Nitrogenoxides[2])	
		limit value 1-1-1985 (gr/GJ)	possible abatement measure	limit value 1-1-1985 (gr/GJ)	possible abatement measure
Solid	> 300	ca. 100 (1)	FGD	ca. 230 (3)	CM
	100-300	ca. 295 (1)	Lime,low s-coal (± 0.7% s) FGD partly	ca. 285 (3)	no
	< 100	ca. 490 (1)	low s-coal (± 1.1.% s	ca. 285 (3)	no
Liquid	> 300	ca. 100 (2)	FGD	ca. 130 (4)	CM
	100-300	ca. 420 (2)	low s-oil (± 1.0% s) or FGD partly	ca. 130 (4)	no or CM
	< 100	ca. 420 (2)	low s-oil (± 1.0% s) or FGD partly	ca. 130 (4)	CM no or CM
Gaseous	> 300	pm		ca. 100 (5)	CM
	100-300			ca. 100 (5)	no or CM
	< 100			ca. 100 (5)	no or CM

FGD = Flue Gas Desulphurization. CM = Combustion modification
Lime = Lime stone injection. FBC = Fluidised bed Combustion. Low-s coal and low s oil are oil and coal with a low sulphur content.

Notes:

1) Transformation from mgr/Nm3 into gr:GJ, based on hard coal with a heat value of 29.3 ton/PJ and 7.2 m³ fluegas/kg (6% 02). In the case of brown coal limit values in gr/GJ strongly depend on the heat value.
2) Transformation based on heavy fuel oil with a heat value of 42 ton/PJ and 10.3 m³ fluegas/kg (3% 02)
3) Based on a conversionfactor for hard coal from mg/Nm³-gr/GJ of 0.356
4) Based on a conversionfactor for fuel oil from mg/Nm³-gr/GJ of 0.292
5) Based on a conversionfactor for natural gas from mg/Nm³-gr/GJ of 0.282.

3. FUTURE EMISSIONS (REFERENCE CASE) AND EMISSIONS OF LARGE COMBUSTION PLANTS TO BE ABATED

3.1. Projection of unabated reference emissions

To calculate the costs of the Directive it is necessary to determine the amount of emissions to be abated to meet the Directive. Therefore it is necessary to compare unabated emissions in 1995 with the desired emission levels under the Directive.
In relation to the projection of unabated emissions, of SO_2 and NO_X, of LCP's (large combustion plants) in 1995:

- first a projection was made of the emissions of all industrial and all power plants, irrespective of their size, in 1980,
- data were collected on the actual amount of emissions from LCP's in 1980,
- emissions of LCP's in 1995 were calculated assuming a constant ratio between actual LCP-emissions in 1980.[1])

This procedure resulted in a projection of emissions of LCP's to be abated in 1995 to meet the bubble part, or the percentage reduction, of the Directive. Results are shown in table 3.1, for SO_2, and table 3.2, with regards to NO_X.
For this projection an emissions submodule was created which uses the following sources of information. [2])

* Fuel use in power plants in 1995 was based on UNIPEDE (1987). Fuel use, in the same year, in industrial installations (including conversion sectors such as refineries) was based on the 'Energy 2000' study carried out on behalf of the Commission (Guilmot et al., 1986) except for Spain and Portugal. For the latter countries, not covered by Guilmot et al. (op. cit.), data were based on IEA (1986);

---

[1]) That is to say: LCP emissions in 1995 = (actual LCP emissions 1980 / simulated total emissions in industry and power plants 1980) x simulated total emissions in industry and power plants in 1995. Proces emissions were excluded.

[2]) The data on fuel use and emission factors are reported in the annex to this report.

* Emission factors for SO_2 were mainly based on calculations from data of IIASA (Amann et al., 1986), on heat value, sulphur content and sulphur retained in ash, but were amalgamated with other data from various sources (Schulz, 1986; CITEPA, 1986; Beck, 1986; CEC, 1984a; Department of the Environment, 1983, Department of the Environment, 1986; Hoogervorst, 1985; Ryck, 1983).
* Emission factors for NO_x were based on CITEPA (1986) and completed with data from various national sources, mentioned under SO_2 emission factor data.
* Fuel use in 1980 was based on EUROSTAT (1982) and IEA (1983).

3.2. Results

These data resulted in a projection of total (fuel related) emissions in 1995 (and 1980) of all industrial and all power plants, irrespective of their size (see column 3 and 6 of tabel 3.1., respectively 3.2.). From these simulations a projection was made of the total emissions from large combustion plants in 1995. This projection was compared with the target for 1995, as resulting from the required % reduction of the Directive. Regarding the resulting volume of emissions to be abated the following remarks are to be made:

- emissions of large combustion plants for 1980 are based on the CEC 1987b).
- emissions for SO_2 are more firm and more politically accepted than those for NO_x although for some countries, notably Spain and Portugal, various sources (CEC, 1987b; Arthur DL, 1986) present different figures. Emissions for NO_x are not (yet) affirmed by member states and are more uncertain. For some countries, e.g. Italy, these 1980 emissions actually include emissions from combustion units smaller than 50 MWth.
- emission factors for NO_x are less firm as for SO_2 especially for Spain and Italy. In practice emission factors will depend on various factors, such as the size, the type of furnace and combustion conditions; in this study such a distinction was not possible.
- The volume of emission abated is determined by the assumption that the share of LCP's emissions in total industrial and power plants emissions is constant. In view of economies of scale this is less plausible. A sensitivity analysis revealed that in the case of constant amount of emissions of small combustion plants over time:[3])

---

[3]) That is to say: LCP emissions in 1995 = simulated total emissions in industry and power plants in 1995 -/- (simulated total emissions in industry and power plants in 1980 -/- simulated emissions from LCP's industry and power plants in 1980). This corresponds with a constant amount of emissions from small combustion plants.

Table 3.1. SO_2 emissions to be abated in 1995

TABLE 3.1. SO2 EMISSIONS TO BE ABATED IN 1995

COUNTRY	LARGE PLANTS EMISSION 1980 (kton)	ALL INDUSTRIAL AND POWER PLANTS (kton)	REDUCTION 1995 (%)	CEILING 1995 (kton)	EMISSIONS IN 1995 ALL INDUSTRIAL AND POWER PLANTS (kton)	ONLY LARGE PLANTS (constant share) (kton)	EMISSIONS TO BE ABATED 1995 (kton)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
B	530	572	45	292	387	345	67
DK 1)	323	303	45	178	342	362	187
F	1910	2244	45	1051	919	585	-268
FRG 1)	2225	2483	45	1224	2541	2283	1053
GR	250	247	0	250	273	273	23
IRE	99	118	0	99	194	175	64
I	2450	3065	45	1348	2628	2013	753
L	3	1	0	3	0	2	-3
NL 1)	299	386	45	164	418	331	159
P	280	198	0*	360	360	360	0
SP	2290	2351	10	2061	2303	2242	182
UK	3600	3772	45	1980	3483	3311	1344

REMARKS

* = GRANTED AN INCREASE IN ITS EMISSIONS

1) EXCLUDING PRESENT NATIONAL POLICY

1) Figures in column 3 and 6 are derived from the emission submodel, EXCEPT PORTUGAL AND GREECE. GREECE AND PORTUGAL for 1995 (column 6) based on submissions from the CEC

2) Column 7 assumes that the share of large plants (= Official emissions large combustion plants 1980 divided by the simulated total emissions of all industrial and power plants remains constant over time.

3) Figures in column 3 and 6 refer to power plants only for GREECE, IRELAND, and LUXEMBOURG

TABLE 3.2. NOX EMISSIONS TO BE ABATED IN 1995

	EMISSIONS 1980				REFERENCE EMISSIONS 1995		
		ALL INDUSTRIAL			ALL INDUSTRIAL	ONLY LARGE PLANTS	EMISSIONS TO BE ABATED
COUNTRY	EMISSION 1980	AND POWER PLANTS	REDUCTION 1995	CEILING 1995	AND POWER PLANTS	(constant share)	1995
	(kton)	(kton)	(%)	(kton)	(kton)	(kton)	(kton)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
B	136	154	30	95	130	115	20
DK	124	140	30	87	186	165	78
F	368	522	30	258	269	190	-68
FRG 3)	1062	1450	30	743	1263	925	182
GR	24	37	0*	38*	59	38	0
IRE	24	39	0	24	72	44	20
I	649	647	30	454	910	913	459
L	1	20	0	1	17	1	0
NL 3)	110	159	30	77	185	128	51
P	23	50	0	23	132	85	62
SP	450	435	10	405	483	500	95
UK	954	1139	30	668	1201	1006	338

REMARKS

* = GRANTED AN INCREASE

0) Data on 1980 emissions besed on CEC 16/6/1987. This ere date collected in the freme of EC emission inventory. These date ere not confirmed by member states.

1) Figures in column 3 end 6 are besed on the emissions submodel

2) column 7 is calculated under the assumption that the ratio between official emissions from large plants in 1980 (column 2) and simulated emissions of all industrial and power plants in 1980 (column 3) remains constant over time.

3) PRESENT NATIONAL ABATEMENT POLICY NOT INCLUDED IN REFERENCE EMISSIONS

Table 3.2. NO_x emissions to be abated in 1995

* the amount of SO_2 emissions could be lower for Belgium (-20%) and Italy (-15%), higher for Ireland (+ 15%), but would not alter substantially for the remaining countries.
* regarding NO_X emissions the amount of emissions to be abated could be higher for Ireland (+ 50%), the Netherlands (+ 20%), Portugal (+ 25%), and lower for Belgium (- 15%) but would not alter substantially for remaining countries.

However, one should not that it might be possible as well that the share of LCP's increases even more this might be due to the replacement of existing, small units by new units, larger than 50 MWth. In the absence of firm data on the size distribution of new industrial plants it remains, for the time being, impossible to draw any firm conclusions.

3.3. Assessment of costs

To be able to assess the costs of the Directive the following problems were to be tacked as well:

- insufficient data on the size distribution of new, industrial large combustion plants were available to assess the costs of emissions standards, proposed in the Directive, for this category of new LCP's,
- several member states, Denmark, the Federal Republic of Germany and the Netherlands, already accepted legislation to control acidifying emissions, such as the SO_2 and NO_X emissions from LCP's.

The method to cope with these problems was as follows:

- In the absence of national legislation it was assumed that EC countries would start with abatement measures for their new large power plants coming on stream before 1995.
- If this proved insufficient to meet the amount of emission to be abated, to meet the percentage overall reduction of the Directive, additional measures were assumed to be taken in the most cost-effective manner. This meant selecting between more stringent measures on new power plants, as was the case for NO_X, or additional measures on existing power plants, such was usually the case for SO_2 emissions.
- In the presence of a national control strategy countries were assumed to start with the application of their own legislation.
- However, if this proved insufficient to meet the amount of emission to be abated (to meet the percentage overall reduction of the Directive) additional measures were assumed to be taken in the most cost-effective manner. This involved selecting between more stringent measures on new power plants, as was the case for NO_X, or additional measures on existing power plants, such was usually

the case for SO_2 emissions.[4])
The results of this procedure are presented in section 6. First of all the methodology of calculating the costs of the different abatement techniques for each country is presented (section (4).
Moreover, the present national abatement strategies of Denmark, the Federal Republic of Germany and the Netherlands are described (section 5).

---

[4]) One should note that subtile differences between national emission standards for new plants and the ones proposed by the Commission in its Directive were not taken into account. Although these differences exist these were not expected to have a major impact on the costs of meeting the Directive.

4. COST MODULE

4.1. Introduction

This section describes the method to calculate the costs of the distinguished abatement techniques. Section 4.2 presents the SO_2 abatement costs and section 4.3 NO_x abatement costs.
All figures are presented in ECU as well as in Deutschmarks because the costs module is mainly based on German figures. All costs are expressed in 1985 (market) prices including VAT.

4.2. Costs of SO_2 abatement technologies

4.2.1. Introduction

The following options have been selected:
- flue gas desulphurisation (FGD)
- low sulphur content coal
- low sulphur content heavy fuel oil
- fluidised bed combustion in combination with the addition of lime
- sorbent injection (SI)

In this study costs of FGD are treated in a detailed manner since this is a likely technique to be used to meet the emission limit standards for large combustion plants.

4.2.2. Flue gas desulphurisation

Several processes of treatment of flue gases to remove sulphurdioxide have been developed and are commercially available (Davids and Lange, 1984). Up to 95% of sulphurdioxide can be removed. With these technologies it is possible to comply to the most stringent limit values, those for large (>300 MWth) plants.
In case of FGD economies of scale are important. The larger the plant the higher the sulphur content of the fuel, the smaller specific (ECU/ton abated) costs will be.

Investments

The investment in FGD depends on the size of the boiler, the flue gas volume and the sulphur emission as well as the type of FGD. The following investment equation, based on a gypsium producing proces has been used (Schulz, 1986b; Schärer, 1986b):

(1) Investment = (8.85/size + 0.077)* 1000 *(0.6 a/b +0.4*c/d*S1/S0)
(in ECU/KWe)[1])

Influence of size — Impact of flue gas volume and of sulphur content

Size = size is expressed in MWe
a = flue gas volume of specific fueltype (m3/MWh)
b = flue gas volume of the standard hard coal (m3/MWh)
c = SO_2 emission of specific fuel (kg/MWh)
d = SO_2 emission of the standard hard coal (kg/MWh)
S0 = sulphur content of the standard hard coal (%)
S1 = actual specific sulphur content (%)

This equation relates investment to a reference case as function of sulphur content, flue gas volume and size.

The basic data for these investment function stem mainly from: an inquiry held by the Umweltbundesamt into the manufacturers of flue gas purification plants and from information on the costs of SO_2 control plants, which are under construction or already operating, in the Federal Republic of Germany. It is believed that these data, being based on relevant Western Europese experience allow a better impression on the costs of FGD than Japanese or US figures (OECD, 1986) especially due to differences in design and method of calculating costs.
The assumption is thus made that the investment costs of an FGD unit with the same size, the same fuel type and the same sulfhur emission will be the same everywhere in Europe. The existence of a free accessible market for FGD equipment and know-how is believed to minimize cost differences between countries.
The above standard equation, however, allows taking into account country specific elements as size, type of fuel (flue gas volume, sulphur retention in ash) and sulphur content. Country specific data used in the calculations are given in section 4.4.
In the case of existing plants additional retrofitting costs are necessary. These are estimated at 30% of the initial investment (Technische Advies Commissie, 1984; Amann, 1987).

Annual costs
Annual costs of FGD consist of:
* Capital costs (depreciation and interest)
* Operating costs:
  - Fixed
  - Variable costs: materials (limestone, water), electricity and wages).

---

[1]) Investment = (19.7/size + 0.172)* 1000 *(0.6 a/b + 0.4* c/d*S1/S0) (in DM/KWe). This reflects the exchange rate of 1985: 1 DM = 0.499 ECU.

Capital costs depend on the investment, the real interest rate and the (economic) lifetime of the plant. Capital costs are calculated on an annuity base (fixed annual sum of the investment) which implies the following equation:

$$(2)\ \text{capital costs} = I \frac{*(i/1000)}{\{1-(1+i/100)^{-n}\}}$$

in which:
I is the investment; i is the real interest rate (%)
n is the economic life time (year)
The following generic data are used for the lifetime(year):

- New power plants (electricity generation)	25
- Existing power plants	15
- New industrial plants	15
- Existing power plants	10

Interest rates per country are given in section 4.4.

For the operating costs functions and data were based on Schärer (1986b):
Fixed annual costs (tax, insurance, administration and maintenance and repair) are 7 % of the investment.
Annual material costs depend on limestone and water use as well as size, operating hours, sulphur content, heat value and sulphur retained in ash.
The sulphur content, the heat value and sulphur retained in ash, define the emission factor used in the following equation:

$$(3)\ \text{annual material costs: } = (0.86/2 * e + 120) * h * 0.499 \quad \text{(in ECU/annum)}$$

in which:
e: stands for the emission factor in ton SO_2 per PJ
c: capacity in MWe
h: operating hours (in 1000 hours per year)
Prices used: limestone: 35 DM/ton (15.7 ECU/ton)
water : 1 DM/m^3 (0.45 ECU/m^3)

Annual electricity costs depend on the electricity price, the operating hours and the size of the plant.:

$$(4)\ \text{annual electricity costs: } = Pe * c * h * 0.499 * 10000 \quad \text{((ECU/annum)}$$

Pe: electricity price in DM/KWh

Electricity prices used are country specific (see section 4.4.)

Annual wage costs are based on the assumption that for each plant, irrespective of the size, five men are needed for operating (Schärer, 1986). The assumed wage sum per menyear is 60,000 DM (26950 ECU/menyear).
Due to the fact that wage costs are virtually unimportant in total abatement costs in the calculation of the abatement costs no differentation is made on a country by country base.

4.2.3. Low sulphur content coal

Emission reduction can be reached by using fuel with a lower sulphur content. There are no investments.
The additional annual costs of imported hard coal with low sulphur percentages above 0.6% are nihil (Ministry VROM, 1985; Technische Advies Commissie, 1984). Even a reduction up to 0.35% S seems to be possible at this moment (Ministry VROM, 1985) without any additional costs. The availability of the latter sulphur coal on the market is very limited. However, this is not sufficient tp meet standards in case of larger (>300 MWth) plants. It is for plants with a smaller capacity.
In the case of use of domestic solid fuels the use of low sulphur fuels is not expected to be possible.

4.2.4. Low sulphur heavy fuel oil

Annual costs for low sulphur fuel oil down up to 1% can be based on market price differences between low and high sulphur content fuel oil. The price per ton fuel oil rises as the sulphur content is lower: the so called sulphur premium. This premium is circa 2000 guilders per % S which corresponds with 900 DM per ton SO_2 abated (400 ECU/ton SO_2) (Ministry VROM, 1985; Technische Advies Commissie, 1984). This value is not correct however if the sulphur content is reduced in the range from 1 to 0.5% S. In the latter case the cost per ton are some 2,500 DM/ton SO_2 removed (1120 ECU/ton SO_2)(IVM, 1986; Technica, 1984). One should note that large differences in opinion exist on the costs of this control option (S% < ca 1%) and a wide range is available (Elam, 1985; Concawe, 1981).
Limit values for plants with capacities smaller than 300 MWth can be met by using oil with a sulphur content of ca 0.9%.

4.2.5. Fluid bed combustion (FBC)

FBC is a new emerging combustion technology on the brink of maturity. If fluid bed combustion is used in new, hard coal fired units, addition of lime is a possibility to reduce emissions. Annual costs are estimated at 300 DM/ton SO_2 removed (135 ECU/ton SO_2) if a reduction takes place of 65%, from 700 ton/PJ (1% S) to 250 ton/PJ to 140 ton/PJ - still higher than the limit value for large (>300 MWth) plants -; an additional reduction of 45%) costs 1050 DM/ton SO_2 abated (470 ECU/ton SO_2) because more lime has to be added (IVM, 1986). There are no additional investments.

Emissions of NO_x from FBC-plants are relatively low.
For plants with a capacity of more the 300 MWth FBC is not (yet) an attractive combustion technique, compared with conventional ones.

4.2.6. Dry Sorbent Injection (DSI) 2)

Chemicals like lime or limestone react at high temperatures with SO_2 forming compounds like gypsum. This offers a possiblility for abatement used in DSI: lime is injected into the furnace and the products are removed from the fluegas together with the fly ash. The removal efficiency is lower the FGD: ca 50%. Its field of application is therefore not wide.
It is an old technique in which interest recently has been increased because of the need for low cost, moderate control techniques useful in situations where no high performance control is necessary.
This need follows from crash programmes to lower SO_2 emissions in acid rain policy.
Next to flue gas desulphurisation DSI can be a cost effective means to reduce SO_2 emissions. Especially in the case of existing smaller (<300 MWth) plants with a limited residual lifetime and few annual operating hours DSI can be attractive due to the, compared to FGD, relatively low investment costs.

Investments

Table 4.4. presents an overview of available data on the initial investments.

Table 4.4. Investment in sorbent injection by country.

Country	FRG(1)	Finland	France	US	US	FRG(2)	FRG(3)
Investment							
(ECU/KWe)	16	48	24	33	198	18/36	71
(DM/KWe)	(35)	(106)	(53)	(74)	(441)	(39/81)	(159)
Range							
(ECU/KWe)	13-54	32-74	27-33	33	198	18-36	71
(DM/KWe)	(29-120)	(71-165)	(59-74)	(74)	(441)	(39/81)	(159)

source: Schweers (1986), Remmers et al. (1986), Amann (1987) Rule of thumb: 1 MWth=3.5 MWe.

Schweers (1986) developed two estimates of the investment: a low estimate of 66 ECU/KWe and a high estimate of 198 ECU/KWe, based on the figures in the first five columns of tabel 4.4.. In view of other German data (column 6 and 7) the high estimate of Schweers seems an overestimate.

---

2) Muzio L.J. and Offen G.R., Dry sorbent emission control technologies, JAPCA, 37, p. 642-654.

For the purpose of this study the investment is estimated at 103 ECU/KWe (230 DM/KWe). For existing installations the initial investment is 30% higher.

Annual costs

Capital costs can be calculated from this investment using data on interest rate and lifetime in section 4.2.2. (FGD).
Operating costs are summarised in table 4.5.

Table 4.5. Operating costs of sorbent injection (ECU/ton SO_2 abated).

Type of costs	Low S-coal	High S-coal
sorbent cost	66-469 (147-1045)	66-469 (147-1045)
fly ash disposal	115-133 (256-297)	80-83 (177-185)
total costs	181-602 (403-1342)	146-552 (324-1230)
efficiency	50-70%	50-70%

note: figures in brackets expressed in DM/ton SO_2 abated
source: Schweers (1986)

In view of other German data (Amann, 1987), claiming that operating costs, apart from energy, wages and fixed costs are some 700 DM/ton SO_2 (320 ECU/ton SO_2) the operating costs seem to be more near the upper side of the above range.
For the purpose of this study operating costs of 880 DM/ton SO_2 (396 ECU/ton SO_2 abated) have been used in order not to underestimate the costs. The removal efficiency used is 50%.

4.3. NO_x abatement technologies

4.3.1 Introduction

In the costs submodule four control options are distinguished:
- Selctive catalytic reduction (SCR);
- Combustion modification (CM);
- Two stage combustion (TSC);
- Fluid bed combustion (FBC).

4.3.2. Selective catalytic reduction (SCR)

Selective Catalytic Reduction is essentially a flue gas purification technique: with the help of a catalyst NO_x react with ammonia producing nitrogen and water. The practical efficiencies of the available processes are ca. 80%.

Investment

Investments are calculated with the following equations (Schulz

op.cit.) which relate size (expressed in electrical power) to investment in case of new or old (retrofit) plants combusting hard coal.

(5) SCR(NEW)
Investment:= (2.02/size + 0.019 * 1000)
(ECU:KWe)[4])

(6) SCR(EIXITING):
Investment:=(2.8/size + 0.0227 * 1000)
(ECU/KWe)[5])

For oil and natural gas the investment is expected to be lower because of the smaller flue gas volume.

According to the Technische Advies Commissie (1985) and affirmed by Remmers (1986) the initial investment is supposed to be 10% lower for heavy fuel oil and 40% for natural gas. These reductions are taking into account when calculating the initial investment.

Annual costs
Annual costs exist of:
* capital costs (interest and depriciation);
* operating costs:
  - fixed;
  - variable costs: materials (catalyst and ammonia) and energy costs (electricity and steam).

Capital costs depend on the interest rate and the lifetime. For SCR the same data have been used as for FGD (section 4.2.2.).

In operating costs fixed annual costs are 7% of the investment and include tax, insurance, maintenance and repair and administration.
The costs of the catalyst per plant depend on the flue gas volume, the space velocity of the catalyst, the lifetime of the catalyst and the amount of catalyst. The space velocity is the ratio between the flue gas stream and the amount of catalyst. The space velocity also depends on the type of furnace (dry bottom or slag tap furnace). Such distinc-

---

[3]) Main parameter is the volume of flue gas to be treated. It was however not possible to make a detail distiction in fuel types and only three types, - solids (hard coal), fuel oil and natural gas - were distinguished. The selected types of SCR are:
- directly after the boiler (new plants);
- after FGD with reheating (existing plants).

[4] Investment:=(4.5/size + 0.0425 * 1000
[5] Investment:=(6.25/size + 0.506) * 1000

tion however was not possible due to a lack of data on the actual types of furnace in each country. therefore the analysis is based on more frequently used dry bottom furnace. Annual catalyst costs are as follows:

(7) Catalyst costs = Pca/1000000 * size * fgv/sv * 1/n * 0.0449 (million ECU/annum)[6])

In which:
size is expressed in MWe
fgv: flue gas volume (m^3/MWh);
sv: the space velocity (liters/hour);
n: lifetime of the catalyst (year);
Pca: price of the catalyst (DM/m^3).

The space velocity is 3500 l/h for solid fuels and 6000 l/h for oil and natural gas. Data on flue gas volumina are presented in section 4.4.1. The lifetime of the catalyst is 3 year in the case of new installations, and 5 in the case of retrofitting, due to the fact that the mechanic use of catalyst is lower if the SCR plant is placed behind FGD (at the so called cold end). The price for the catalyst is 40,000 DM/m^3 (18,000 ECU/m^3)

Annual ammonia costs are:

(8) Ammonia costs = 0.351 * Pa * NO_X removed * 0.449/1000 (million ECU/annum)[7])

Pa: price of ammonia; 700 DM/ton (315 ECU/ton)
NO_X removed in ktons.

The amount of NO_X removed is influenced by the initial emission factor, the operating hours, the size of the plant and its efficiency; factors being country specific in the costs submodule. A general removal efficiency of 80% of the SCR unit is supposed.

Energy costs consist of electricity use and, in the case of existing plants, steam use for reheating. The amount of electricity is affected by the type of SCR (new/retrofit).

Annual energy costs:

(9) *SCR(NEW):=(3.6 * Pe) * c * h * 0.449/1000 (million ECU/annum)[8])

(10) * SCR(RETROFIT):=(6.0 * Pe + 0.28 * Ps) * c * h * 0.449/1000 (million ECU/annum)[9])

---

[6]) Catalyst cost = Pca/1000000 * size * fgv/sv * 1/n (million DM/annum)

[7]) Ammonia costs = 0.351 * Pa * NO_X removed (million DM/annum)

In which:
Pe : electricity price (DM/KWh)
Ps : steamprice (DM/GJ), which is 10 DM/GJ (4.49 ECU/GJ)
c : capacity in MWe
h : operating hours in 1000 hours per year
Electricity prices are country specific and shown in table 4.6 (section 4.4).

As stated the expected reduction with SCR is 80%; in combination with combustion modification (CM) a reduction of some 90% (88%) is expected. The application of SCR in combination with two stage combustion is not feasible.

4.3.3. Combustion modification, two stage combustion and fluid bed combustion

For power plants (electricity generation) the investment in combustion modification and two stage combustion is based on Tangena (1985) and Technische Advies Commissie (1985). Combustion modifications stands for the use of low NO_x burners in combination with boiler modifications. Irrespective of the size the investments are:
combustion modification: 9 DM/KWe (4 ECU/KWe)
two stage combustion : 12 DM/KWe (5.4 ECU/KWe).
In the case of retrofitting (existing plants) the investments are twice as high (Tangena, op. cit.).
Combustion modification is expected to reduce emissions with 40%, two stage combustion with 55%. Two stage combustion is supposed to take place only in new hard coal fired units. In industrial plants the investment in CM is 4.5 DM/KWth (2.0 ECU/KWth). Assuming an average load factor of 0.5, which corresponds with 4400 operating hours per year, the investments equals 0.28 million DM/PJ (0.126 million ECU/PJ). PJ is the amount of fuel input. In the case of retrofitting investments are twice as high. A reduction of 40% is expected.
For both CM and TSC on power and industrial plants there are no annual costs supposed other than capital costs (interest and depriciation). These costs are calculated from the initial investment in the same manner, and with the same data, as the capital costs of FGD.
If fluid bed combustion is applied to new coal fired units the reduction of the unabated NO_x emission is 55% (IVM, 1986). There are no additional costs nor investments involved. Fluid bed combustion is not seen yet as a standard technique applicable all units unless this is explicitly the case in the energy scenario used.

---

[8]) * SCR(NEW):=(3.6 * Pe) * c * h * 1/1000
(million ECU/annum)
[9]) * SCR(RETROFIT):= (6.0 * Pe + 0.28 * Ps) * c * h * 1/1000
(million DM/annum)

4.4. Country specific data.

4.4.1. Fuel characteristics.

Schulz et al. present a table with properties of solid fuel which will be used in planned power plants. These data are copied in table 4.1. As reference the properties of standard coal are presented. It can be seen that in some countries fuel will be used with characteristics widely differing from the standard.

Table 4.1. Characteristics of specific fuel types

Fuel characteristics Fuel type	Sulphur content (SO)	Sulphur in ash %	Heat value (MJ/Kg)	Fluegas volume (a)	SO_2 emission (e)
standard hard coal (imported)	1.5	5	29.4	3250	8.1225
lignite ptolemais) (norther Greece)	0.6	30	5.6	5140	12.6
lignite Megalopis (southern Greece)	0.9	30	4.2	6150	25.1
brown lignite (Spain)	2.6	30	7.3	9314	41.7
black lignite (Spain)	3.4	30	19.6	3555	20.3
domestic coal (Spain)	1.2	5	21.8	4398	8.76
lignite (Northern Ireland)	1.0	30	8.4	4925	13.9
domestic hard coal* (United Kingdom)	2.5	5	27.3	3240	9.33
Heavy fuel oil	2.5	0	42.25	2381	10.4

* The coal from the U.K. contains considerable amounts of chlorine leading to extra investments in FGD.

Within the cost submodule (see section 4.2) the above data were used to derive country specific investment equations. In the case of the United Kingdom however dechlorination of the domestic hard coal seems unevitable before FGD can take place (Cooper et. al; 1987). Few experience exists yet with this proces but this technique is believed to increase the initial investment with some 10%. Additional operating costs, apart from capital costs are not expected (Halstead; 1987). This is due to the fact that higher operating costs, are outbalanced as a result of the smaller amount of waste by products and related removal costs. In the case of the United Kingdom the initial investment resulting from the investment equation hence is raised with 10%.

4.4.2. Other data

Table 4.2. Real interest rates (%, in 1985) by country

Belgium	5.5	Italy	5.5
Denmark	7.5	Luxemburg	5.5
FR Germany	5.1	Netherlands	4.6
France	6.0	Portugal	9.3
Greece	- 2.8*	Spain	4.6
Ireland	10.2	United Kingdom	5.3

note: Greece real interest rate is unplausible on the long run. Data are based on the database of the OECD INTERLINK model.

Table 4.3. Electricity prices (in DM/Kwh) by country

Belgium	0.120	(5.50)	Italy	0.109	(5.06)
Denmark	0.076	(3.45)	Luxemburg	0.108	(5.01)
FR Germany	0.129	(6.00)	Netherlands	0.124	(5.79)
France	0.103	(4.79)	Portugal	0.143	(6.67)
Greece	0.119	(5.54)	Spain	0.128	(5.97)
Ireland	0.147	(6.86)	United Kingdom	0.121	(5.64)

note: Figures in brackets are in 100 ECU/Kwh. Prices are based on CEC (Bulletin of energy prices no. 2, (1986)) and refer to industrial large scale use excluding VAT.

Table 4.4. Operating hours power plants (1000 hours per annum)

	hard coal	oil		hard coal	oil
Belgium	5.7	3.5	Italy	6.0	3.8#
Denmark	5.9*		Luxemburg		
FR Germany	4.5**	1.4****	Netherlands	5.9	2.8##
France			Portugal	6.2	2.5
Greece	6.4		Spain	5.6	
Ireland	7.3*****	4.9	United Kingdom	5.7***	1.1

* 2.9 for medium load, hard coal, power plants
** 7.1 for brown coal
*** 4.2 for brown coal
**** 2.5 for gaseous fuels
***** 5.4 for brown coal
# 3.65 for all existing irrespective of fuel type
natural gas
(Source: UNIPEDE, 1987)

For industrial plants:
Germany : operating hours 5.8 (> 300 MWth)
Netherlands: 6.4 (> 300 MWth)
All other countries and capacities 4400 hours per year

Table 4.5. Energy efficiency power plants

	hard coal	oil		hard coal	oil
Belgium	0.38	0.38	Italy	0.38	0.39
Denmark	0.37*		Luxemburg		
FR Germany	0.37**	0.33****	Netherlands	0.40	0.3##
France			Portugal	0.37	0.36
Greece	0.29###		Spain	0.39	
Ireland	0.41*****	0.38	United Kingdom	0.35***	

* idem for medium load hard coal power plants
** 0.33 brown coal
*** 0.29 brown coal
**** 2.5 for gaseous fuels
***** 0.21 for brown coal
# natural gas
brown coal
(Source: UNIPEDE, 1987)
For all industrial plants: 0.4 (rule of thumb)

5. PLANNED NATIONAL POLICIES

5.1. Introduction

Denmark, the Federal Republic of Germany and the Netherlands have already accepted legislation to reduce their emissions from large combustion plants. The United Kingdom also has the intention to reduce these emissions. Unsufficient information, however, was available on the latter policy (Department of the Environment, 1986). Moreover, available data indicated that, insofar the planned application of flue gas desulphurization and combustion modification on some power plants in the United Kingdom, would already be taking place before 1995, these measures are nog sufficient to meet the bubble requirements of the Directive on large combustion plants. Hence in this section only the planned policies of Denmark, Germany and the Netherlands are described.

5.2. Denmark

Policy and emission reduction

In 1984 Denmark implemented legislation to reduce SO_2 emissions. For power plants a maximum level of 125 kilotons/year in 1995 was set. In addition to this, for all sectors, the sulphur content in fuel oil, being already restricted to 1.5% (1.0% in Copenhagen) at 1-10-1985, will be reduced further to 1% from 1-1-1988. The sulphur content in coal is restricted to 1.2% except for power stations were emissions are regulated by the quota system (Semi-Metra conseil and CITEPA, 1985). Denmark has not yet legislation to reduce it's NO_x emissions.
The Danish Ministry of the environment expects SO_2 emissions from power plants to fall down with some 40% in 1995 over the 1980 level. District heating SO_2 emissions will drop with 70% and industrial emissions with 40% over the same period. Total emissions from power plants, district heating and industry are expected to be reduced with 45%. Emissions from large plants are expected to fall down from 323 kiloton in 1980 to 170 kiloton in 1995 (CEC, 1987b). This implies a 47% reduction which is just sufficient to meet the minimum reduction under the bubble concept.

Abatement measures, costs and investments

The emission quotum for power plants will be met by a programme of flue gas desulphurization on some 4000 MWe of new and existing coal fired plants. In addition heavy fuel oil used for the sector electricity generation will have a sulphur content of 1.0% instead of 2.5%.
In the industrial sector it is expected that the maximum sulphur content in coal and fuel oil is to be met through the purchasing of low sulphur fuels[1]). The regulations, however, do grant other measures, for example fluidised bed combustion, provided that they are at least as effective as the sulphur in fuel limitations.

Table 5.1. Costs of SO_2 reduction in Denmark (in million ECU of 1985)

Sector	Measure	Investments (1985-1995)	Annual costs (1995)	Emission reduction (Kton) (1995)
Power	FGD new	143	28.3	55
Plants	FGD retrofit	292	55.3	95
	1%S in fuel oil	0	2.3	6
Industry	1%S in fuel oil	0	17.2	44
	1.2%S in coal	0	0	2
TOTAL		436	103.1	201

note: For details see section 6. Calculated with the costs module.

This reduction is enough to meet the bubble concept, only a minimum reduction of 187 kilotons (45%) was necessary.

5.3. Federal Republic of Germany

Policy and emission reduction

In 1983 the Ordinance on large firing installations ('Gross Feureranlagen Verordnung') became effective. This Ordinance lays down emission standards for SO and NO_x for new plants as well as existing plants. The standards apply to plants with a thermal rating of 50 MW or more, which burn solid or liquid fuels, and to plants of 100 MW or more which solely use gaseous fuels. In 1984 the Conference of Federal and State Environment Ministers introduced more stringent emission standards for NO_x emissions. In 1986 the technical instruction for air pollution control measures (TALUFT) was tightened. This instruction restricts

---

[1]) It is expected that gasoil is especially used in small firing installations. Costs and impacts of this measure are not taken into account.

emissions from smaller combustion plants (gaseous < 100 MWth, other < 50 MWth) and industrial proces emissions (Lange, 1986a, 1986b; Lange, 1984).
As a result of this policy, excluding the impact of the TALUFT, SO_2 emissions of power plants, including district heating, are SO_2 emissions of power plants, including district heating, are expected to drop by 75% in 1995 over the 1980 level. Industrial SO_2 emissions, excluding proces emissions, are expected to fall down with some 55% in the same period. Hence total combustion emissions of industry and power plants ('large combustion plants') will fall back with 65% in 1995 over the 1980 level.
NO_X emissions from power plants, including district heating, will be some 70% lower in 1995 whereas industrial NO_X combustion emissions from power plants and industrial units will drop with some 65% (Bundesministerium für Wirtschaft, 1986; Beck, 1986). These reductions are especially the result of the Ordinance on large firing installations and the tightened NO_X standards of 1984. The reductions of the present German policy are more than sufficient to meet the minimum reductions under the bubble concept required by the Directive.

Abatement measures, investments and costs
Practical implications of the policy are as follows:

SO_2
For installations with a thermal capacity, exceeding 300 MWth, flue gas desulphurization (removal efficiency 85%) is necessary if these installations are new, or their remaining operating hours exceed 30.000 hours. If remaining operating hours are in the range of 10.000-30.000 hours the use of low sulphur fuels is sufficient. These limits have to be met by July 1988. For installations with a size between 100 to 300 MWth 60% desulphurization, or equivalent measures leading to the same reduction, is required before 1990.

NO_X
Flue gas denitrification has to be installed on new and old installations of more then 300 MWth, selective catalytic reduction being the most favoured technique. The installation of combustion modification is expected in order to meet the less strict standards for smaller units. The investments and costs of the reduction of SO_2 emissions are only fairly well known for the extensive flue gas desulphurization programme (Schärer, 1986a; Lange et al., 1986). These estimates, however, do not include the costs of low sulphur fuels and presumably not all industrial installations are included. Estimates of the Umweltbundesamt (Schärer, 1986b; Lange, 1986) suggest that up to 1995 13 to 14 milliard DM (some 6.0 milliard ECU) is expected to be invested in flue gas desulphurization. In the case of NO_X emissions investments in flue gas cleaning plants are approximately 7 milliard DM (3 milliard ECU).

Table 5.2. presents the expected investments and costs of the present policy as calculated with the costs module.
The costs of NO_x reduction assume the application of Selective Catalytic Reduction (SCR), in combination with combustion modifications on all plants larger then 300 MWth. Smaller plants are expected to install only combustion modification.

Table 5.2. Costs of SO_2 reduction in Germany (in million ECU of 1985)

Sector	Measure	Investments (1985-1995)	Annual costs (1995)	Emission reduction (Kton) (1995)
Power Plants	FGD new	1576 (1576)	307 (307)	733 (733)
	FGD retrofit	2623 (3682)	533 (741)	737 (1000)
Industry	FGD new	580 (580)	133 (133)	247 (247)
TOTAL		4770 (5828)	972 (1180)	1716 (1980)

note: Figures in brackets include costs and investments of measures taken before 1-1-1985. For details see Technical document section 6.

Table 5.3. Costs of NO_x reduction in Germany (in million ECU of 1985)

Sector	Measure	Investments (1985-1995)	Annual costs (1995)	Emission reduction (Kton) (1995)
Power Plants	SCR+CM new	455	187	230
	SCR+CM retrofit	495	267	221
	CM new	9	2	13
	CM retrofit	174	17	97
Industry	SCR+CM retrofit	365	178	112
	CM new	132	17	54
TOTAL		1620	667	727

note: For details see section 6.

For SO_2 as well as for NO_x the reduction of the German policy exceeds the required minimum reduction under the bubble concept.

5.4. The Netherlands

Policy and emission reduction

In 1987 an ordinance on emission standards for combustion installations ('Algemene maatregel van bestuur grote vuurhaarden') came into force. This ordinance contains emission standards for interalia NO_x en SO_2 for new and existing installations. This legislation incorporates ear-

lier policies of 1982 which aimed at the control of coal fired installations ('Tweede circulaire kolengestookte installaties'). De ordinance formulates special standards for refineries. These standards apply to all process and combustion emissions of a specific refinery and are tightened in three stages (Keizer, 1987; Ministerie VROM, 1985).
As a result of this policy SO_2 emissions from power plants are expected to fall down with some 70%, in 1995 compared to 1980, industrial emissions will drop with 35% (Bakema et al., 1986).
Even with this policy NO_x emissions from power plants and industry are expected to either stay at the same level or decrease only slightly (some 10%) (Keizer, 1987; Bakema et al., 1986). Hence the control policy is insufficient to meet the bubble reduction of 30% of the EC Directive.

Abatement measures, investments and costs

SO_2
For the sector power plants flue gas desulphirization is required for all converted and new coal fired plants (some 4500 MWE), with some exceptions for plants which are taken out of operation before 1995.
Plants without flue gas desulphurization are to use coal with a sulphur content of 0.8%. Industrial standards (corresponding with standards for plants smaller than 300 MWth) can be met by a reduction in the sulphur content of fuel oil to 1%S, for new and existing plants, as well as the application of fluidised bed combustion for new coal fired installations.
For refineries, however, one standard is formulated for proces emissions and combustion emission. Measures to control combustion emission are hard to predict. The calculation of control costs, however, assumes the application of flue gas desulphurization in combination with measures to control procesemissions (VROM, 1985; VROM, 1985b).

NO_x
New coal fired power plants (2800 MWe) will use two stage combustion. Converted coal fired power plants as well as some new gas fired units will apply combustion modification. Furthermore an extensive program of retrofitting some 5500 MWe of gasfired power plants is expected. Combustion modification and fluidised bed combustion is foreseen for new oil and coal fired industrial plants [2]).
This Dutch policy involves the following investments and costs.

---

[2]) For gasturbines and gas engines separate measures as steam injection and flue gas recirculation are expected. Due to the fact that is was impossible to distinguish such type of installations on EC-level, these measures are not taken into account.

Table 4.5. Costs of SO_2 reduction in the Netherlands (in million ECU of 1985).

Sector	Measure	Investments (1985-1995)	Annual costs (1995)	Emission reduction (Kton) (1995)
Power Plants	FGD new	152	30	67
	FGD retrofit	332	59	100
	0.8%S in fuel oil	0	0	10
Industry	0.8%S in fuel oil	0	0	13
	1.0%S in coal	0	6	13
	FGD retrofit	148	34	53
TOTAL		436	128	256

note: For details see section 6.

Due to the fact that the bubble concept only required a reduction of 159 kilotons in 1995, the Dutch policy by far exceeds the minimum reduction of 45%. This is different, however, for NO_x.

Table 5.5. Costs of NO_x reduction in the Netherlands (million ECU of 1985).

Sector	Measure	Investments (1985-1995)	Annual costs (1995)	Emission reduction (Kton) (1995)
Power Plants	TSC new coal	15	2	22
	CM new + old	60	5	23
Industry	FBC new	0	0	1
	CM new	3	0	2
TOTAL		83	7	48

note: For details see section 6.

The proposed Directive on large combustion plants, however, calls for a reduction of the Dutch NO_x-emission with at least 30% which corresponds with a reduction of some 52 kilotons in 1995. Additional measures are needed and are the subject of the next section.

6. DETAILED RESULTS OF COSTS AND INVESTMENTS AS CALCULATED WITH THE COST MODULE

6.1. Introduction

The next pages contain the detailed results of the calculation of costs and investments of reducing SO_2 respectively NO_x emissions.
First the results for SO_2 are presented for each EC country. Results for France, Luxembourg and Portugal are not included since these countries are not expected to have any costs to meet the Directive. For Denmark, Germany, and the Netherlands the results are the results of their own national strategy.
Secondly, results for the abatement of NO_x emissions are presented. Greece, France and Luxembourg are excluded since these countries have no abatement costs. The figures for Germany refer to their present policy.
Next to the presented data the costs module calculates other figures which might be useful but are not reported:

- investment/KWe
- investment/ton abated SO_2 or NO_x
- annual costs/ton abated SO_2 or NO_x

All figures are presented in Deutschmark of 1985 at market prices (including VAT)[1]. Investments as well as annual costs are presented in million DM. Abbreviations used for several fuel types are:

c = coal
o or hfo = heavy fuel oil
ng = natural gas
bc = brown coal
Other data such as electricity price, interest rate and operating hours are already presented in section 4 (the costs module) of this document and in the Annex.

---

[1]) Exchange rate used (1985) ECU = 2.23 DM (1 DM = 0.449 ECU)

COSTS 45% SO2			BELGIUM											
SCENARIO: UNIPEDE			PRICES: DEUTSCHMARK OF 1985 (INCLUDING TAX)											
STRATEGY: CEC		PERIOD:	up to 1995											
1	2	3	4	5	6	8	10	14	15	16	17	18	19	24
BELGIUM							INVEST-							
						ABATEMENT	MENTS	ANNUAL COSTS (in MIO DM of 1985) of which:						
YEAR	TYPE	NAME	FUEL	CAPACITY	SIZE	MEASURE	TOTAL	CAPITAL	OPERATING COSTS:				TOTAL	AVOIDED
FGD ON "NEW" POWER PLANTS				(MWe)	(MWe)			COSTS	Fixed	Energy	Meterial	Wages	COSTS	(Kton)
1985	conversion	Langerlo 1	C/o/ng	200	200	FGD (retro)	43	3.2	3.0	1.4	0.4	0.3	8.3	5.5
1986		Langerlo 2	C/o/ng	200	200	FGD (retro)	43	3.2	3.0	1.4	0.4	0.3	8.3	5.5
1987		Ruien 5	C/o	160	160	FGD (retro)	38	2.8	2.6	1.1	0.3	0.3	7.2	4.4
1988	new FBC		c	105	105	FBC	0	0.0	0.0	0.0	0.5	0.0	0.5	1.8
TOTAL EMISSION STANDARDS POWER PLANTS				665			124	9.2	8.7	3.8	1.7	0.9	24.3	17.2
FGD STRATEGY TO MEET BUBBLE														
Additional lime FBC			c	105	105	FBC (lime)	0	0.0	0.0	0.0	0.7	0.0	0.7	0.7
FGD	power plant	not defined	oil	980	200	FGD (retro)	405	40.3	28.3	4.1	2.9	1.5	77.1	48.8
TOTAL IF FGD STRATEGY				1750			529	49.6	37.0	7.9	5.3	2.4	102.2	67

COSTS 45% SO2			DENMARK											
SCENARIO: UNIPEDE			PRICES: DEUTSCHMARK OF 1985 (INCLUDING TAX)											
STRATEGY: CEC		PERIOD:	up to 1995											
1	2	3	4	5	6	8	10	14	15	16	17	18	19	24
DENMARK:							INVEST-							
(COSTS AND INVESTMENTS OF PRESENT NATIONAL POLICY)						ABATEMENT	MENTS	ANNUAL COSTS (in MIO DM of 1985) of which:						
YEAR	TYPE	NAME	FUEL	CAPACITY	SIZE	MEASURE	TOTAL	CAPITAL	OPERATING COSTS				TOTAL	AVOIDED
POWER PLANTS				(MWe)	(MWe)			COSTS	Fixed	Energy	Material	Wages	COSTS	(Kton)
1988/94	new	various	c/o	470	235	FGD	107	9.6	7.5	2.1	1.2	0.6	21.0	17
1991	new	various	c/o	350	350	FGD	71	6.4	5.0	1.5	0.9	0.3	14.1	13
1991	new	various	c/o	686	343	FGD	141	12.6	9.8	3.0	1.7	0.6	27.8	25
1986	existing	various	c/o	600	600	FGD(retro)	143	12.8	10.0	2.6	1.5	0.3	27.2	22
1987	existing	various	c/o	700	700	FGD(retro)	163	14.6	11.4	3.1	1.8	0.3	31.1	26
1987	existing	various	c/o	700	350	FGD(retro)	186	16.6	13.0	3.1	1.8	0.6	35.1	26
1987	existing	various	c/o	269	269	FGD(retro)	77	6.9	5.4	1.2	0.7	0.3	14.4	10
1987	existing	various	c/o	300	300	FGD(retro)	83	7.4	5.8	1.3	0.8	0.3	15.6	11
SUBTOTAL	FGD			4075			970	87.0	67.9	17.8	10.3	3.3	186.2	150
1% sulfur fuel oil		power plants	hfo			1% S		0.0	0.0	5.1	0.0	0.0	5.1	6
SUBTOTAL POWER PLANTS							970	87.0	67.9	22.9	10.3	3.3	191.4	155.8
MEASURES INDUSTRIAL PLANTS														
irrelevant		industries	hfo			1%S				32.1			32.1	35.7
irrelevant		refineries	hfo			1%S				6.8			6.8	7.5
irrelevant		industries	c			1.2%S				0.0			0.0	1.9
SUBTOTAL INDUSTRY										38.9			38.9	45.1
FINAL TOTAL							970	87.0	67.9	61.8	10.3	3.3	230.3	201

		COSTS 45% SO2												
SCENARIO: UNIPEDE			PRICES: DEUTSCHMARK OF 1985 (INCLUDING TAX)											
STRATEG CEC		PERIOD:	up to 1995											
1	2	3	4	5	6	8	10	14	15	16	17	18	19	24
GERMANY							INVEST-							
						ABATEMENT	MENTS	ANNUAL COSTS (in MIO DM of 1985) of which:						
YEAR	TYPE	NAME	FUEL	CAPACITY	SIZE	MEASURE	TOTAL	CAPITAL	OPERATING COSTS:				TOTAL	AVOIDED
NEW PUBLIC POWER PLANTS				(MWe)	(MWe)			COSTS	Fixed	Energy	Material	Wages	COSTS	(Kton)
85/87	new	Karlsruhe	c	505	505	FGD	101	7.2	7.1	2.9	1.1	0.3	18.7	18
85/87	new	Various	c	2760	690	FGD	524	37.6	36.7	16.0	6.2	1.2	97.7	97
85/87	new	Zolling/Altbach	c	840	420	FGD	174	12.5	12.2	4.9	1.9	0.6	32.0	29
85/92	new	Berlin Reuter W	c	560	280	FGD	128	9.2	9.0	3.3	1.3	0.6	23.3	20
88/92	new	Walsum	c	385	385	FGD	81	5.8	5.7	2.2	0.9	0.3	14.9	14
88/92	new	Munchen nord	c	322	322	FGD	71	5.1	5.0	1.9	0.7	0.3	13.0	11
88/92	new	Stoeken 1+2	c	224	224	FGD	55	4.0	3.9	1.3	0.5	0.3	9.9	8
88/92	new	Heferwehr	c	120	120	FGD	38	2.7	2.7	0.7	0.3	0.3	6.7	4
1993	new	STGT Garsburg	c	135	135	FGD	41	2.9	2.8	0.8	0.3	0.3	7.1	5
SUBTOTAL NEW COALFIRED UNIPEDE				5851										
88/92	new	Goldenberg	bc	1710	570	FGD	353	25.3	24.7	15.7	4.5	0.9	71.1	70
85/87	new	Buschhaus	bc	320	320	FGD	75	5.4	5.2	2.9	0.8	0.3	14.7	13
93/95	new	Neurath	bc	1156	587	FGD	238	17.0	16.6	10.6	3.1	0.6	47.9	47
SUBTOTAL NEW BROWN COALFIRED UNIPEDE				3186										
OTHER NEWFIT PERIOD 1985-1995														
85/95	newfit	Various	hard co	7149	300	FGD	1608	115.3	112.6	65.5	25.5	7.1	326.0	396
TOTAL NEWFIT FROM 1985-1995				16186										
										CONTINUED ON THE NEXT PAGE				

GERMANY							INVEST-							
						ABATEMENT	MENTS	ANNUAL COSTS (in MIO DM of 1985) of which:						
YEAR	TYPE	NAME	FUEL	CAPACITY	SIZE	MEASURE	TOTAL	CAPITAL	OPERATING COSTS:				TOTAL	AVOIDED
				(MWe)	(MWe)			COSTS	Fixed	Energy	Material	Wages	COSTS	(Kton)
EXISTING POWER PLANTS FROM 1985-1995														
85/95	retrofit	various	bc	9163	300	FGD(retro)	2831	274.6	198.2	83.9	24.3	9.2	590.1	376
85/95	retrofit	various	c	10284	300	FGD(retro)	3008	291.8	210.6	59.7	23.3	10.3	595.6	361
TOTAL FGD PUBLIC														
POWER PLANTS FROM 1985-1995				35633			9327	816.3	652.9	272.2	94.8	32.6	1868.8	1470
INDUSTRIAL POWER PLANTS														
85/95	newfit	undefined	c	4916	300	FGD	1013	98.2	70.9	45.0	14.5	4.9	233.5	210
85/95	newfit	undefined	bc	1351	300	FGD	278	27.0	19.5	12.4	2.8	1.4	63.0	37
FINAL TOTAL														
FINAL TOTAL INDUSTRIAL AND														
PUBLIC POWER PLANTS 1985-1995				41900			10618	941.5	743.2	329.6	112.1	38.9	2165.3	1716
**********	**********	**********	**********	**********	**********	**********	**********	**********	**********	**********	**********	**********	**********	**********
FGD POWER PLANTS INSTALLED BEFORE 1985														
86/95	backfit	various	c	7200	300	FGD(retro)	2106	204.3	147.4	41.8	16.3	7.2	417.0	253
86/95	backfit	various	hfo	1000	300	FGD(retro)	253	24.5	17.7	1.8	0.7	1.0	45.7	11
SUBTOTAL INSTALLED BEFORE 1985				8200			2359	228.776	165.1	43.6	16.99	8.2	462.67	263
FINAL TOTAL 1980-1995				50100			12976	1170.3	908.3	373.2	129.0	47.1	2628.0	1980
**********	**********	**********	**********	**********	**********	**********	**********	**********	**********	**********	**********	**********	**********	**********
OTHER MEASURES, FOR EXAMPLE IN REFINERIES OR LOW SULFUR CONTENT FUELS NOT TAKEN INTO ACCOUNT.														

	COSTS 45% SO2				GREECE AND IRELAND									
SCENARIO: UNIPEDE			PRICES: DEUTSCHMARK OF 1985 (INCLUDING TAX)											
STRATEGY: CEC		PERIOD:	up to 1995											
1	2	3	4	5	6	8	10	14	15	16	17	18	19	24
GREECE							INVEST-							
					Average	ABATEMENT	MENTS	ANNUAL COSTS (in MIO DM of 1985) of which:					TOTAL	
YEAR	TYPE	NAME	FUEL	CAPACITY	SIZE	MEASURE	TOTAL	CAPITAL	OPERATING COSTS:				COSTS	AVOIDED
POWER PLANTS				(MWe)	(MWe)			COSTS	Fixed	Energy	Material	Wages		(Kton)
1989	new	Megalopoli 4	bc	300	300	SORBENT I.	69	1.9	0.0	0.0	22.3	0.3	24.5	25
TOTAL TO MEET THE BUBBLE							69	1.9	0.0	0.0	22.3	0.3	24.5	25
IRELAND														
					Average	ABATEMENT		ANNUAL COSTS (in MIO DM of 1985) of which:						
YEAR	TYPE	NAME	FUEL	CAPACITY	SIZE	MEASURE	TOTAL	CAPITAL	OPERATING COSTS:				TOTAL	AVOIDED
NEW POWER PLANTS				(MWe)	(MWe)			COSTS	Fixed	Energy	Material	Wages	COSTS	(Kton)
1985/87	new (retro)	Moneypoint 1	c	276	276	FGD(retro)	83	9.2	5.8	2.9	1.0	0.3	19.2	13
1985/87	new (retro)	Moneypoint 2	c	276	276	FGD(retro)	83	9.2	5.8	2.9	1.0	0.3	19.2	13
1985/87	new (retro)	Moneypoint 3	c	276	276	FGD(retro)	83	9.2	5.8	2.9	1.0	0.3	19.2	13
	new	Moneypoint 4	c	276	276	FGD	64	7.1	4.5	2.9	1.0	0.3	15.8	13
	TOTAL NEW			1104			312	34.9	21.8	11.6	3.9	1.2	73.5	53
FGD STRATEGY TO MEET BUBBLE														
	existing	North Well	o	125	125	FGD(retro)	62	8.2	4.3	1.1	0.6	0.3	14.6	11
TOTAL IF FGD STRATEGY				1229			373	43.1	26.1	12.9	4.5	1.5	88.1	64

. COSTS SO2 BUBBLE REDUCTION 1995						ITALY							
SCENARIO: UNIPEDE 87													
STRATEGY: CEC		PERIOD:	up to 1995										
1	2	3	4	5	6	8	10	14	15	16	17	18	19	24
ITALY							INVEST-							
					Average	ABATEMENT	MENTS	ANNUAL COSTS (in MIO DM of 1985) of which:						
YEAR	TYPE	NAME	FUEL	CAPACITY	SIZE	MEASURE	TOTAL	CAPITAL	OPERATING COSTS:				TOTAL	AVOIDED
NEW POWER PLANTS				(MWe)	(MWe)			COSTS	Fixed	Energy	Material	Wages	COSTS	(Kton)
85/87	new	Petrafitta1/2	c	150	150	FGD(retro)	48	3.6	3.4	1.0	0.3	0.3	8.5	4
1985/86	new	Torvaldiglia4	o	640	640	FGD (retro)	216	16.1	15.1	2.7	2.3	0.3	36.4	38
1987	new	Sulcis 3	c	228	228	FGD (retro)	62	4.6	4.4	1.5	0.5	0.3	11.3	6
1988/94	new	Various	c	3000	300	FGD	580	43.2	40.6	19.6	6.2	3.0	112.6	80
1988/94	new	Sicilia/s.Barbara	o	1200	300	FGD	475	35.4	33.2	5.0	4.2	1.2	79.0	71
1988/94	new	Various	c	7680	640	FGD	1267	94.4	88.7	50.2	15.8	3.6	252.7	204
1988/94	new	various	c	400	200	FGD	88	6.6	6.2	2.6	0.8	0.6	16.8	11
1985/86	conversion	Brindisi 3+4	c/o	600	300	FGD(retro)	151	11.2	10.6	3.9	1.2	0.6	27.6	16
1988/90	conversion	various	c/o	1500	300	FGD(retro)	377	28.1	26.4	9.8	3.1	1.5	68.9	40
1991	conversion	various	c/o	600	200	FGD	132	9.8	9.2	3.9	1.2	0.9	25.1	16
1991	conversion	S.Filipe de Mele	c/o	300	150	FGD	74	5.5	5.2	2.0	0.6	0.6	13.9	8
TOTAL "NEW"				16298			3469	258.6	242.8	102.2	36.2	12.9	652.8	493
FGD STRATEGY TO MEET BUBBLE														
EXISTING POWER PLANTS														
FGD	existing	various	o	4280	300	FGD(retro)	1693	168.6	118.5	17.7	15.1	4.3	324.2	260
TOTAL IF FGD-STRATEGY							5162	427.3	361.3	119.9	51.3	17.2	977.0	753

COSTS SO2 BUBBLE REDUCTION 1995						NETHERLANDS								
SCENARIO:UNIPEDE 87														
STRATEGY: CEC		PERIOD:	up to 1995											
1	2	3	4	5	6	8	10	14	15	16	17	18	19	24
NETHERLANDS NATIONAL POLICY														
					Average	ABATEMENT		ANNUAL COSTS (in MIO DM of 1985) of which:						
YEAR	TYPE	NAME	FUEL	CAPACITY	SIZE	MEASURE	TOTAL	CAPITAL	OPERATING COSTS:				TOTAL	AVOIDED
NEW POWER PLANTS				(MWe)	(MWe)			COSTS	Fixed	Energy	Material	wages	COSTS	(Kton)
1987	conv.new	Borssele	c/ng	402	201	FGD(retro)	130	8.8	9.1	2.9	1.1	0.6	22.6	15
1987	conv.new	Maasvlakte	c/ng	1038	516	FGD(retro)	261	17.8	18.3	7.6	2.8	0.6	47.0	39
1987	conv.new	Amer	c/ng	645	323	FGD(retro)	180	12.3	12.6	4.7	1.7	0.6	31.9	24
1987	conv.new	Maasvlakte	c/ng	596	298	FGD(retro)	170	11.6	11.9	4.4	1.6	0.6	30.0	22
93/95	new	Various	c	1800	600	FGD	339	23.1	23.7	13.2	4.8	0.9	65.8	67
TOTAL FGD POWER PLANTS				4481			1079	73.6	75.6	32.8	12.0	3.3	197.2	167
Other	existing	various	c			% S 0.8		0.0					0.0	10
SUBTOTAL POWER PLANTS				4481			1079	73.6	75.6	32.8	12.0	3.3	197.2	176.9
INDUSTRIES			c			% S 0.35	0	0.0					0.0	13
			hfo			% S 1	0			12.3			12.3	14
REFINERIES			hfo	720	125	FGD(retro)	330	41.9	23.1	5.7	3.4	1.7	75.8	53
SUBTOTAL INDUSTRIES				720			330	41.9	23.1	18.1	3.4	1.7	88.2	79
FINAL TOTAL				5201			1410	115.5	98.7	50.8	15.4	5.0	285.4	256

COSTS SO2 BUBBLE REDUCTION 45 % : SPAIN AND THE UNITED KINGDOM

SPAIN							INVEST-							
						ABATEMENT	MENTS	ANNUAL COSTS (in MIO DM of 1985) of which:						
YEAR	TYPE	NAME	FUEL	CAPACITY	Average	MEASURE	TOTAL	CAPITAL	OPERATING COSTS:				TOTAL	AVOIDED
"NEW" POWER PLANTS:				(MWe)	size			COSTS	Fixed	Energy	Meterial	wages	COSTS	(Kton)
1985/90	new	Different	c	1572	524	FGD(retro)	394	26.8	27.6	11.3	4.0	0.9	70.6	57
92/95	new	various	c(dom)	978	326	FGD	282	19.2	19.8	7.0	3.1	0.9	50.0	48
92/95	new	various	c	1551	517	FGD	300	20.4	21.0	11.1	3.9	0.9	57.4	56
SUBTOTAL				4101			976	66.5	68.3	29.4	11.0	2.7	178.0	160
NOT SUFFICIENT TO MEET BUBBLE REQUIREMENTS														
	existing	undefined	c	550	550	FGD(retro)	137	12.8	9.6	3.9	1.4	0.3	28.0	20
FINAL TOTAL TO MEET THE BUBBLE CONCEPT							1113	79	78	33	12	3	206	180
UNITED KINGDOM														
					everage	ABATEMENT		ANNUAL COSTS (in MIO DM of 1985) of which:						
YEAR	TYPE	NAME	FUEL	CAPACITY	SIZE	MEASURE	TOTAL	CAPITAL	OPERATING COSTS:				TOTAL	AVOIDED
NEW POWER PLANTS				(MWe)	(MWe)			COSTS	Fixed	Energy	Meterial	wages	COSTS	(Kton)
1993/95	new	N-Ireland	bc	408	136	FGD	206	15.0	14.4	2.1	0.8	0.9	33.2	16
1993/95	conversion	Tilbury+Turrock	c/o	2584	646	FGD	612	44.8	42.9	17.8	8.8	1.2	115.5	152
1985/87	new	Drax 5+6	c	1250	625	FGD(retro)	387	28.3	27.1	8.6	4.3	0.6	68.9	73
1989/90	conversion	Kilroot 1+2	o/c	560	280	FGD	159	11.6	11.1	3.9	1.9	0.6	29.1	33
TOTAL NEW POWER PLANTS				4802			1364	99.7	95.5	32.4	15.8	3.3	246.7	274
EXISTING POWER PLANTS														
	existing	Not defined	c	18200	600	FGD(retro)	5672	557.6	397.1	125.5	62.1	9.1	1151.4	1070
TOTAL POWER PLANTS IF FGD STRATEGY				23002			7036	657.3	492.5	157.9	78.0	12.4	1398.1	1344

COSTS OF 30% NOx REDUCTION 1995					BELGIUM						
SCENARIO: UNIPEDE											
STRATEGY: CEC		PERIOD:	up to 1995								
BELGIUM											
1	2	3	4	5	6	8	INVEST-MENTS	14	15	19	24
YEAR	TYPE	NAME	FUEL	CAPACITY (MWe)	SIZE (MWe)	MEASURE	TOTAL	CAPITAL COSTS	OPERATING COSTS	TOTAL COSTS	AVOIDED (Kton)
NEW POWER PLANTS											
CM	conversion	Langerlo 1	C/o/ng	200	200	CM(retro)	4	0.3	0	0.3	1.2
CM	conversion	Langerlo 2	C/o/ng	200	200	CM(retro)	4	0.3	0	0.3	1.2
CM	conversion	Ruien 5	C/o	160	160	CM(retro)	3	0.2	0	0.2	1.0
FBC	fluid bed	not defined	C	105	105	FBC	0	0.0	0.0	0.0	0.8
TOTAL "NEW" POWER PLANTS				665			10	0.8	0.0	0.8	4.3
SELECTION OF MEASURES TO MEET THE BUBBLE:											
INSTEAD OF CM TWO STAGE COMBUSTION IS AN OPTION FOR THESE NEW POWER PLANTS											
TSC	conversion	all	C/o/ng	560	200	TSC(retro)	15	1.1	0	1.1	4.7
FBC	fluid bed	not defined	C	105	105	FBC	0	0.0	0.0	0.0	0.8
NEW SUBTOTAL "NEW POWER" PLANTS							15	1	0	1	5.5
STILL ADDITIONAL MEASURES ARE NEEDED TO MEET THE BUBBLE:											
CM	power plant	existing	C	2348		CM(retro)	42	4.2	0	4.2	14.5
FINAL TOTAL TO MEET THE BUBBLE:							57	5.3	0.0	5.3	20.0

COSTS OF 30% NOx REDUCTION 1995					DENMARK						
SCENARIO: UNIPEDE											
STRATEGY: CEC		PERIOD:	up to 1995								
DENMARK:							INVEST-	(IN MILLION DM OF 1985)			
						ABATEMENT	MENTS	ANNUAL COSTS of which:			
YEAR	TYPE	NAME	FUEL	CAPACITY	SIZE	MEASURE	TOTAL	CAPITAL	OPERATING	TOTAL	AVOIDED
POWER PLANTS				(MWe)	(MWe)			COSTS	COSTS	COSTS	(Kton)
CM	new	various	c/o	1506	301	CM	14	1.2	0	1.2	16.3
CM	conversion	various	c/o	2569	428	CM(retro)	46	4.1	0	4.1	27.8
SUBTOTAL CONVERSION AND NEW				4075			60	5.4	0	5.4	44.1
THIS IS UNSUFFICIENT TO MEET THE BUBBLE:											
Also Two Stage Combustion instead of CM is possible:											
TSC	new	various	c/o	1506	301	TSC	20	1.8	0	1.8	22.4
TSC	conversion	various	c/o	2569	428	TSC(retro)	67	6.0	0	6.0	38.2
CM	existing	coal	c	3280		CM(retro)	59	6.7	0	6.7	17.4
SUBTOTAL IF TSC ON ALL NEW AND CONVERTED COAL FIRED UNITS AND CM ON 3/4 OF ALL REMAINING EXISTING COAL UNITS:											
TOTAL COSTS							145	14	0	14	78

COSTS OF 30% NOX REDUCTION 1995 — FEDERAL REPUBLIC OF GERMANY

SCENARIO: UNIPEDE

STRATEG CEC — PERIOD: up to 1995

1	2	3	4	5	6	8	INVEST-	14	15	16	17	18	19	24
PRESENT GERMAN POLICY						ABATEMENT	MENTS	ANNUAL COSTS (in MIO DM of 1985) of which:						
YEAR	TYPE	NAME	FUEL	CAPACITY	SIZE	MEASURE	TOTAL	CAPITAL	OPERATING COSTS:		MATERIALS:		TOTAL	AVOIDED
SCR				(MWe)	(MWe)			COSTS	Fixed	Energy	catalyst	NH3	COSTS	(Kton)
85/87	new	Karlsruhe	c	190	190	CM+SCRnew	14	1.0	1.0	0.3	2.4	0.6	5.3	2.4
85/87	new	Various	c	1390	700	CM+SCRnew	81	5.8	5.6	2.3	17.2	4.2	35.2	17
85/87	new	Zolling/Altbach	c	840	420	CM+SCRnew	52	3.7	3.7	1.4	10.4	2.6	21.8	10
85/92	new	Berlin Reuter W	c	280	280	CM+SCRnew	19	1.4	1.3	0.5	3.5	0.9	7.5	3
88/92	new	Walsum	c	385	385	CM+SCRnew	24	1.7	1.7	0.6	4.8	1.2	10.0	5
88/92	new	Munchen nord	c	322	322	CM+SCRnew	21	1.5	1.5	0.5	4.0	1.0	8.5	4
88/92	new	Stoeken 1+2	c	224	224	CM+SCRnew	16	1.1	1.1	0.4	2.8	0.7	6.1	3
88/92	new	Heferwehr	c	120	120	CM+SCRnew	11	0.8	0.7	0.2	1.5	0.4	3.6	1
88/92	new	Goldenberg	bc	570	570	CM+SCRnew	34	2.4	2.4	1.5	7.1	3.1	16.5	13
SUBTOTAL NEW PLANTS UNIPEDE 85/92				4321			272	19.5	19.0	7.8	53.5	14.6	114.4	59
86/92	newfit	Various	c	7284	300	CM+SCRnew	485	34.7	33.9	12.2	90.2	22.2	193.2	90
86/92	newfit	Various	bc	1810	302	CM+SCRnew	120	8.6	8.4	4.8	22.4	9.9	54.2	40
93/95	new	Goldb +Neurath	bc	1728	576	CM+SCRnew	103	7.3	7.2	4.6	21.4	9.5	50.0	38
93/95	new	STGT Gersburg	c	135	135	CM+SCRnew	11	0.8	0.8	0.2	1.7	0.4	3.9	2
TOTAL NEWFIT FROM 1986-1995				15278			991	71.0	69.4	29.6	189.2	56.5	415.7	230.1
86/95	backfit	coal	c	212	40	CM+SCRretro	48	4.6	3.3	3.3	2.6	0.6	14.5	2.6
86/95	backfit	coal	c	2743	300	CM+SCRnew	183	17.7	12.8	4.6	34.0	8.4	77.4	34
		oil	o	1420	720	CM+SCRnew	74	7.2	5.2	2.1	4.5	2.9	21.8	12
	ordered	hard coal	c	2639	300	CM+SCRretro	236	22.9	16.5	40.6	32.7	8.0	120.7	32.8
	ordered	brown coal	bc	6286	300	CM+SCRretro	562	54.5	39.4	154.7	77.8	34.4	360.8	140.0
TOTAL SCR POWER PLANTS FROM 1986-95				16233			2093	177.9	146.5	234.8	340.7	110.9	1010.9	451.2

CONTINUED ON THE NEXT PAGE

1	2	3	4	5	6	8	INVEST-	14	15	16	17	18	19	24
PRESENT GERMAN POLICY						ABATEMENT	MENTS	ANNUAL COSTS (in MIO DM of 1985) of which:						
YEAR	TYPE	NAME	FUEL	CAPACITY	SIZE	MEASURE	TOTAL	CAPITAL	OPERATING COSTS:		MATERIALS:		TOTAL	AVOIDED
COMBUSTION MODIFICATION														
85/87	new	Various	c	2285	irrelevant	CM	21	1.5	0.0	0.0	0.0	0.0	1.5	13
CM	existing	brown coal	bc	2000	irrelevant	CM(retro)	36	3.5	0.0	0.0	0.0	0.0	3.5	20
CM	existing	hard coal	c	11020	irrelevant	CM(retro)	198	19.2	0.0	0.0	0.0	0.0	19.2	61
CM	existing	oil	hfo	7469	irrelevant	CM(retro)	134	13.0	0.0	0.0	0.0	0.0	13.0	14
CM	existing	gaseous	g	1065	irrelevant	CM(retro)	19	1.9	0.0	0.0	0.0	0.0	1.9	2
FINAL TOTAL POWER PLANTS							2502	231.0	161.5	250.8	357.7	128.9	1069.0	585
INDUSTRIAL PLANTS >300MWth														
REFINERIES														
SCR	existing	fuel oil	hfo	1447	125	CM+SCRret	157	20.5	11.0	28.7	4.6	2.9	67.6	11.6
SCR	existing	ref.gas	gas	2382	125	CM+SCRret	139	18.1	9.7	47.2	7.6	4.5	87.0	18.2
SCR	existing	gaseous	nat. gas	1149	125	CM+SCRret	125	16.2	8.7	22.8	3.6	2.2	53.6	8.8
OTHER INDUSTRIES > 300 MWth														
SCR	existing	solids	c	2683	125	CM+SCRret	318	41.4	22.3	53.2	19.9	9.8	146.6	39.8
SCR	existing	gaseous	g	3015	125	CM+SCRret	176	22.8	12.3	59.8	9.6	6.4	110.9	26.1
SCR	existing	liquids		898.2	125	CM+SCRret	97	12.7	6.8	17.8	2.9	1.8	41.9	7.2
							812	105.6	56.8	172.2	33.7	27.5	395.9	111.8
INDUSTRIAL PLANTS > 50 MWth and < 300 M(PJ)														
CM	new +old	solids		128.1		CM(40%new)	57	7.5	0.0	0.0	0.0	0.0	7.5	16.2
CM	new +old	liquid		140.7		CM(40%new)	63	8.2	0.0	0.0	0.0	0.0	8.2	9.6
CM	new +old	gaseous		370		CM(40%new)	166	21.6	0.0	0.0	0.0	0.0	21.6	27.2
REFINERIES > 50 MWth AND < 300 MWth														
CMrefi	new +old	liquids		4.9		CM(40%new)	2	0.3	0.0	0.0	0.0	0.0	0.3	0.3
CMrefi	new +old	gaseous		11.9		CM(40%new)	5	0.7	0.0	0.0	0.0	0.0	0.7	0.8
SUBTOTAL INDUSTRY AND REFINERIES >50MWth							1106	143.9	56.8	172.2	33.7	27.5	434.1	165.9
FINAL TOTAL POWER PLANTS AND INDUSTRIES							3607	360.9	203.4	407.1	374.5	138.3	1484.1	727

. COSTS OF 30% NOX REDUCTION IN 1995 GREECE AND IRELAND											
SCENARIO: UNIPEDE STRATEGY: CEC											
STRATEGY: CEC		PERIOD:	up to 1995								
1	2	3	4	5	6	8	10	14	15	19	24
IRELAND							INVEST-				
					Average	ABATEMENT	MENTS	ANNUAL COSTS (in MIO DM 85)			
YEAR	TYPE	SIZE	FUEL	CAPACITY	SIZE	MEASURE	TOTAL	CAPITAL	OPERATIN	TOTAL	AVOIDED
NEW POWER PLANTS				(MWe)	(MWe)			COSTS	TOTAL	COSTS	(Kton)
CM	new (retro)	Moneypoint 1/3	c	828	276	CM(retro)	15	1.7	0.0	1.7	5.4
CM	new	Moneypoint 4	c	276	276	CM	2	0.3	0.0	0.3	1.8
SUBTOTAL NEW POWER PLANTS				1104			17	1.9	0.0	1.9	7.2
THIS IS NOT ENOUGH TO MEET THE BUBBLE: COSTEFFECTIVE STRATEGIES COULD BE CM ON EXISTING PLANTS AND TSC INSTEAD OF CM ON NEW COALFIRED UNIT											
FINAL SELECTION OF MEASURES:											
CM	existing	Brown coal	bc	409		CM(retro)	7	1.0	0.0	1.0	3.9
TSC	new	Moneypoint 4	c	276		TSC	4	0.4	0.0	0.4	2.5
TSC	new (retro)	Moneypoint 1/3	c	828		TSC(retro)	22	2.4	0.0	2.4	7.4
CM	existing	Fuel oil	hfo	990		CM(retro)	18	2.4	0.0	2.4	5.7
SUBTOTAL BUBBLE POWER PLANTS							50	6.2	0.0	6.2	19.4
IN THIS CASE TSC IS APPLIED TO ALL MONEYPOINT UNITS ; EXISTING BROWN COAL FIRED CAPACITY AND PART OF THE FUEL OIL FIRED CAPACITY IS EQUIPPED V											
WITH CM. THESE EXISTING BC UNITS HAVE A SIZE BELOW 100 MWe.											

COSTS OF 30% NOX REDUCTION ITALY														
SCENARIO: UNIPEDE						(with VAT)								
STRATEGY CEC		PERIOD:	up to 1995											
1	2	3	4	5	6	8	10	14	15	16	17	18	19	24
ITALY							INVEST-							
					Average	ABATEMENT	MENTS	ANNUAL COSTS (in MIO DM of 1985) of which:						
YEAR	TYPE	NAME	FUEL	CAPACITY	SIZE	MEASURE	TOTAL	CAPITAL	OPERATING COSTS:		Materials:		TOTAL	AVOIDED
NEW POWER PLANTS				(MWe)	(MWe)			COSTS	Fixed	Energy	Catalyst	NH3	COSTS	(Kton)
CM	new	coal fired	c	11980	not	CM	108	8.0	0.0	0.0	0.0	0.0	8.0	128
CM	new	coal fired(85/87)	c	2478	important	CM (retro)	45	3.3	0.0	0.0	0.0	0.0	3.3	26
CM	new	oil fired	hfo	1200		CM	11	0.8	0.0	0.0	0.0	0.0	0.8	6
CM	new	oil fired(85/87)	hfo	640		CM (retro)	12	0.9	0.0	0.0	0.0	0.0	0.9	3
SUBTOTAL NEW POWER PLANTS														164
CM	existing	coalfired	c	3795		CM (retro)	68	6.8	0.0	0.0	0.0	0.0	6.8	25
CM	existing	oilfired	hfo	16633		CM (retro)	299	29.8	0.0	0.0	0.0	0.0	29.8	84
CM	existing	natural gas	gas	5205		CM (retro)	94	9.3	0.0	0.0	0.0	0.0	9.3	12
SUBTOTAL CM ON ALL EXISTING POWER PLANTS														285
SCR ON ALL NEW COAL FIRED AND OIL FIRED PLANTS SEEMS INEVITABLE: A LEAST COMBINATION INCLUDING TSC ON NEW COALFIRED PLANTS IS THIS SELECTION:														
TSC	new	coal fired(85/87)	c	2478		TSC (retro)	59	4.4	0.0	0.0	0.0	0.0	4.4	36
CM	new	oil fired	hfo	1200		CM	11	0.8	0.0	0.0	0.0	0.0	0.8	6
CM	new	oil fired(85/87)	hfo	640		CM (retro)	12	0.9	0.0	0.0	0.0	0.0	0.9	3
CM	existing	coalfired	c	3795		CM (retro)	68	6.8	0.0	0.0	0.0	0.0	6.8	25
CM	existing	oilfired	hfo	16633		CM (retro)	299	29.8	0.0	0.0	0.0	0.0	29.8	84
CM	existing	natural gas	gas	5205		CM (retro)	94	9.3	0.0	0.0	0.0	0.0	9.3	12
CM+SCR	new+conv.	coal	c	11980	380	SCR(new)	651	48.6	45.6	28.2	148.3	69.2	339.9	282
SCR	new	oil	hfo	1840	370	SCR(new)	91	6.8	6.3	2.7	9.7	2.9	28.4	12
FINAL TOTAL BUBBLE ALL LARGE PLANTS							1285	107	52	31	158	72	420	460

COSTS OF 30% NOX REDUCTION THE NETHERLANDS

SCENARIO: UNIPEDE (with VAT)

STRATEGY: CEC PERIOD: up to 1995

1	2	3	4	5	6	8	10	14	15	19	24	26
NETHERLANDS							INVEST-	(IN MILLION DM OF 1985)				
					Average	ABATEMENT	MENTS	ANNUAL COSTS				ANNUAL COSTS
YEAR	TYPE	NAME	FUEL	CAPACITY	SIZE	MEASURE	TOTAL	CAPITAL	OPERATIN	TOTAL	AVOIDED	PER TON
NEW POWER PLANTS				(MWe)	(MWe)			COSTS	COSTS	COSTS	(Kton)	(DM/ton)
TSC	new	various	c	2838		TSC	34	2.3	0.0	2.3	22	104
CM	conversion	various	c	1864		CM	17	1.1	0.0	1.1	11	107
CM	new	Velsen	o/ng	360		CM(retro)	6	0.4	0.0	0.4	1	652
CM	various	co generation	g	638		CM(retro)	11	0.8	0.0	0.8	1	652
SUBTOTAL NEW POWER PLANTS							69	4.7	0.0	4.7	35	
CM	existing	gasfired	g	5500		CM(retro)	99	9.3	0.0	9.3	10	897
SUBTOTAL POWER PLANTS							168	14.0	0.0	14.0	45	308
INDUSTRY				(PJ)								
FBC		coal		10		FBC	0	0.0	0.0	0.0	1	0
CM		coal		7		CM	2	0.2	0.0	0.2	1	298
CM		oil		15.7		CM	4	0.4	0.0	0.4	1	351
SUBTOTAL INDUSTRY							6	0.6	0.0	0.6	3	199
SUBTOTAL OWN POLICY							174	14.6	0.0	14.6	48	302
THIS POLICY SEEMS NOT SUFFICIENT. THE APPLICATION OF CM ON EXISTING COALFIRED PLANTS IS ASSUMED												
CM	existing	coal	c	615		CM(retro)	11	1.0	0.0	1.0	4	294
TOTAL TO MEET BUBBLE ALL LARGE PLANTS							185	16	0	16	52	301

COSTS OF 30% NOx REDUCTION 30% IN 1995 PORTUGAL AND SPAIN

STRATEGY: CEC PERIOD: up to 1995 SCENARIO: UNIPEDE 87

PORTUGAL							INVEST-							
NEW POWER PLANTS					Average	ABATEMENT	MENTS	ANNUAL COSTS (in MIO DM of 1985) of which:						
YEAR	TYPE	TYPE	FUEL	CAPACITY	Size	MEASURE	TOTAL	CAPITAL	OPERATING COSTS:		Materials		TOTAL	AVOIDED
SECTOR				(MWe)				COSTS	Fixed	Energy	catalyst	NH3	COSTS	(Kton)
CM	new(85/87)	Sines 1-3	c	900	300	CM(retro)	16	1.7	0.0	0.0	0.0	0.0	1.7	10.9
CM	new	various	c	1500	300	CM	14	1.4	0.0	0.0	0.0	0.0	1.4	18.1
SUBTOTAL NEW POWER PLANTS														29
COMBUSTION MODIFICATION ON EXISTING PLANTS IS THE NEXT STEP														
CM	existing	all	hfo	1704	irreleve	CM(retro)	31	3.9	0.0	0.0	0.0	0.0	3.9	5.4
ADDITIONAL MEASURES ARE NECESSARY: A LEAST COST COMBINATION OF TSC AND SCR ON NEW COALFIRED PLANTS LEADS TO THE FOLLOWING SET OF MEASURES														
FINAL SELECTION OF MEASURES:														
CM	new	various	c	1500	irreleve	CM(new)	14	1.4	0.0	0.0	0.0	0.0	1.4	18.1
TSC	new(85/87)	various	c	600	irreleve	TSC(retro)	16	1.6	0.0	0.0	0.0	0.0	1.6	10.0
CM	new(85/87)	various	c	300	irreleve	CM(new)	3	0.3	0.0	0.0	0.0	0.0	0.3	3.6
CM	existing	all	hfo	1704	irreleve	CM(retro)	31	3.9	0.0	0.0	0.0	0.0	3.9	5.4
SCR	new	coalfired	c	1500	300	SCR(new)	86	9.0	6.0	4.8	18.6	5.3	43.7	21.7
SCR	new(85/87)	coalfired	c	300	300	SCR(retro)	21	2.2	1.5	6.2	2.2	1.1	13.2	4.3
FINAL TOTAL TO MEET THE BUBBLE ON POWER PLANTS ONLY							149	16.2	6.0	4.8	18.6	5.3	50.9	63

SPAIN														
						ABATEMENT		ANNUAL COSTS (in MIO DM of 1985) of which:						
YEAR	TYPE	NAME	FUEL	CAPACITY	Average	MEASURE	TOTAL	CAPITAL	OPERATING COSTS:		Materials		TOTAL	AVOIDED
POWER PLANTS				(MWe)	size			COSTS	Fixed	Energy	catalyst	NH3	COSTS	(Kton)
TSC	new	Different	c	4101		TSC	49	3.4	0.0	0.0	0.0	0.0	3.4	58.3
SUBTOTAL CM NEW POWER PLANTS														
EQUIPING PART OF THE EXISTING CAPACITY WITH CM IS SUFFICIENT:														
CM	existing	various	c	3550		CM retro	64	6.0	0.0	0.0	0.0	0.0	6.0	36.7
FINAL TOTAL							113	9	0	0	0	0	9	95

COSTS NOx BUBBLE REDUCTION 30% IN 1995							THE UNITED KINGDOM						
SCENARIO: UNIPEDE													
STRATEGY: CEC		PERIOD:	up to 1995										
1	2	3	4	5	6	8	10	14	15	19	24	25	26
UNITED KINGDOM							INVEST-	(IN MILLION DM OF 1985)					
					average	ABATEMENT	MENTS	ANNUAL COSTS of which:				INVESTMENT	ANNUAL COST
YEAR	TYPE	NAME	FUEL	CAPACITY	SIZE	MEASURE	TOTAL	CAPITAL	OPERATING	TOTAL	AVOIDED	PER TON	PER TON
NEW POWER PLANTS				(MWe)	(MWe)			COSTS	COSTS	COSTS	(Kton)	(DM/ton)	(DM/ton)
CM	new	N-Ireland	c	408	136	CM	4	0.3	0.0	0.3	3	1166	85
CM	new+conv.	coal	c/o	4394		CM	40	2.9	0.0	2.9	38	1037	76
SUBTOTAL NEW POWER PLANTS:											41		
COMBUSTION MODIFICATION ON ALL EXISTING POWER PLANTS IS NOT ENOUGH:													
CM	existing coal	coal	c	34284		CM(retro)	617	60.7	0.0	60.7	297	2074	204
CM	existing	oil	c	8727		CM(retro)	157	15.4	0.0	15.4	6	24858	2444
SUBTOTAL											345		
IN PRINCIPLE THIS IS ENOUGH BUT APPLICATION OF TSC ON NEW UNITS AND CM ON SOME 95% OF EXISTING COAL FIRED UNITS IS CHEAPER													
FINAL SELECTION OF MEASURES:													
CM	new	N-Ireland	c	408	136	TSC	5	0.4	0.0	0.4	4	1131	83
CM	new+conv.	coal	c/o	4394		TSC	53	3.9	0.0	3.9	52	1006	74
CM	existing coal	coal	c	32570		CM(retro)	586	57.6	0.0	57.6	283	2074	204
FINAL TOTAL TO MEET THE BUBBLE ON ALL LARGE PLANTS:							644	62	0	62	339	1897	182

7. SENSITIVITY ANALYSIS: COSTS AND EMISSIONS REDUCTION OF NEW INDUSTRIAL COMBUSTION PLANTS

7.1. Introduction

The draft Directive on large combustion plants consist of two major elements:

1. Emission standards for new, large combustion plants which are related to the size of the plant (50-100, 100-300 and > 300 MWth);
2. A bubble concept according to which EC countries are to reduce the total emissions from large combustion plants end 1995.

One of the problems encountered in this study was the lack of data on the capacity, and size distribution, of new industrial plants coming on stream the next decade. In the previous sections therefore the costs of abatement measures related to the emission standards for new industrial plants were not taken into account. Instead another approach was followed:

- EC member states started with taking abatement measures to meet the emissions standards for new large power plants or, they would carry out their national legislation (Denmark, Germany and the Netherlands);
- If the above strategy was insufficient to meet the overall reduction, required under the bubble concept, additional abatement measures were assumed to be taken on, either existing or new, power plants.

This approach could imply the following errors:

- the total costs of the Directive could be unerestimated if complying with the emission standards for new large, industrial as well as power, combustion plants demands a more stringent emission reduction than the bubble concept;
- complying with the emission standards for new industrial plants could be a more expensive, or a cheaper, way to meet the bubble reduction than the application of additional measures on power plants.

To account for this problem a sensitivity analysis was carried out. Aim of this analysis was to:

* assess tentatively the costs of the emission standards for new industrial plants for each EC country;
* to analyse the possible impact of meeting these emission standards for the total costs, as calculated in the previous sections, of meeting the Directive.

Due to the lack of comprehensive and firm data additional assumptions had to be made. Therefore the present sensitivity analysis should be looked upon as an exploration of orders of magnitude of costs.
First the data and assumptions on industrial fuel use are presented (section 7.2). Next to that the likely abatement techniques to meet the standards for the different fuel types and plants sizes are discussed (7.3). Subsequently the resulting investments and emission reduction is presented (7.4). Finally these results are compared with the investments and costs calculated in the previous sections (section 6). This in order to explore the sensitivity of the results for the inclusion of explicit measures to meet the emission standards for new, large industrial combustion plants.

7.2. Data and assumptions on structure of fuel use in industry

7.2.1. Fuel consumption in 1980 and 1995, sulphur contents and other important fuel characteristics

The first table contains the available data on consumption of oil and on sulphur contents of the fuel oils in industry.

Table 7.1.A. Consumption (PJ) of fuel oil in 1980 and in 1995. Sulpher contents (%).

Industry Land	Fuel oil 1980	Sulphur content	Gas oil 1980	Sulphur content	Fuel oil 1995	Gas oil 1995Xv
Germany	501.9	0.75	225.6	0.3	310	159
France	464.2	2.9	231.4	0.5	218	80
Belgium	74.5	2	24.5	0.5	80	35
Netherlands	56.2	1.5	18.9	0.45	58.6	25.1
Denmark	49.8	2.5	29	0.5	50	17
U.K.	346.8	3.4	151.6	0.4	234	167
Ireland	38.6	3.4	10.9	1.0	85.6	6.4
Spain	327.6	3	16.2	1.0	505	25
Portugal	79.9	2.3	5.7	1.0	110.5	7.9
Greece	96	3	9.6	1.0	101	24
Luxemburg	3.7	1.5	2.7	0.4	4.2	4.2
Italy	562.6	3.5	19.5	1.4	364	50
EEC Total	2601.8		745.6		2120.9	600.6

(Sources: See text section 3.)

Table 7.1.B shows the corresponding data for coal. In the case of coal combustion, heat values (PJ/t) and the amount of retention of SO_2 (%) in ash are important parameters for the emissions in addition to the sulphur content. These values can differ from country to country. Data on the specific values for coal combusted in industrial plants have not been gathered. In case of coal large variations in the amount of specific flue gas streams are possible. This is a parameter for the costs of the treatment of flue gas. It is incorporated in the estimations of the costs of abatement at power plants. For industrial plants however no data on this aspect have been found. The value given is a typical value for coal available on the world market (Schulz et al).

Table 7.1.B. Consumption of hard coal in 1980 and in 1995. Sulphur contents. Ash retention and flue gas volumes [1])

Industry Country	Hard coal 1980	1995	Heat val. PJ/t	Sulphur content %	Ash retention %	Dry Flue gas. vol. (m^3/kg)
Germany	95	310	27.7	1	5	8
France	87.7	234	29.3	0.9	5	8
Belgium	38.6	63	26.8	1	5	8
Netherlands	1	29.3	29.3	0.8	5	8
Denmark	19.7	29	29.3	1.3	5	8
U.K.	144.3	177.6	24.7	1.5	5	8
Ireland	2.7	16.7	29.3	1.3	5	8
Spain	22.4	49	25.3	1.2	5	8
Portugal	1.4	9	29.3	1.2	5	8
Greece	4	33	29.3	1	5	8
Luxemburg	9.7	12.6	29.3	0.8	5	8
Italy	17.2	134	29.3	0.8	5	8

Table 7.1.C. contains the corresponding figures for the consumption of derived coal (cokes i.e.)

[1]) Flue gas volumes can be calculated from the chemical composition coal (Schulz et al). Data on the different types of coal used in industry however have not be found. The figure used is a typical one for a common type of coal available on the world market. The error introduced is very probably only minor in view of other sources of error.

Table 7.1C.. Consumption of derived coal in 1980 and in 1995. Sulpher contents.

Industry Country	Derived coal 1980	1995	Heat val. PJ/t	Sulphur content %	Ash retention %	Dry Flue gas. vol. (m^3/kg)
Germany	614	247	27.5	0.3	5	8
France	241	134	29.3	0.8	5	8
Belgium	131	79	29.2	0.4	5	8
Netherlands	38.2	29.3	13	0.8	5	8
Denmark	2.7	0	29.3	0.8	5	8
U.K.	102.7	55	26.3	0.8	5	8
Ireland	0.1	0	19.6	0.8	5	8
Spain	66.7	146.4	9	0.8	5	8
Portugal	7.7	49.3	29.3	1	5	8
Greece	7.1	0	24.5	0.8	5	8
Luxemburg	45.4	33.5	29.3	0.8	5	8
Italy	140	71	29.3	0.8	5	8

The figures for flue gas volumes are own estimates.

7.2.2. Size distribution and fuel consumption

The EEC-directive on the limit values of emissions apply to different classes of thermal power of furnaces/combustion plants. In order to be able to estimate the emission reduction as result of the EEC directive information on the distribution of the consumption of fuel over these classes is necessary. The available information (CITEPA) on this aspect of energy consumption is shown in table 7.2.
As can be seen for some countries no information whatsoever was available.

Table 7.2.A. Information on distribution of oil combustion over capacity classes.

"Data" on distribution (%) gas and fuel oil	Capacity furnaces (th) -< 50	50 - 300	(1983) 50-100	100-300	>300
Germany	60	30			10
France	15	65			20
Belgium	42	48			10
Netherlands	50	50			
Denmark	85	15			
U.K.					
Ireland	98				2
Spain					
Portugal					
Greece					
Luxemburg					
Italy					

Table 7.2.B. Information on distribution of coal combustion over capacity classes.

Country	"Data" Capacity furnaces (MWth) < 50	50 - 100	100 -300	> 300
Germany	47	7	16	30
France	41	25	34	0
Belgium	50	25	25	
Netherlands		100		
Denmark	75	10	15	
U.K.				
Ireland	60		40	
Spain				
Portugal				
Greece	100			
Luxemburg	50	25	25	
Italy				

On the distribution of combustion of derived coal over plant capacities no information has been gathered. The figures of coal have been used.

Table 7.3 contains the complete set of data on the distribution that has been used. It is a mixture of "data" and assumptions.

Table 7.3. Assumptions and "data" on the distribution of consumption on fuel oil and gasoil together. 1983.

	Capacity furnaces (MWth) (1983) < 50	50 - 300	50-100	'100-300	>300	Total PJ
Germany	60	30			10	727.5
France	15	65			20	695.6
Belgium	42	48			10	99
Netherlands	50	50			0	75.1
Denmark	85	15			0	78.8
U.K.	50				10	498.4
Ireland	98				2	49.5
Spain	50				10	343.8
Portugal	50				0	85.6
Greece	50				0	105.6
Luxemburg	100				0	6.4
Italy	50				15	582.1

It should be noted that the figures relate to the consumption of fuel oil together with gasoil. The EEC directive however is different for fuel oil and gasoil. These calculations apply only to emissions from combustion of fuel oil. Therefore corrections have to be made on these "data".
It is taken into account that fuel oil tends to be burned in larger furnaces then gas/dieseloil and that in large furnaces (> 300 MWth) only fuel oil will be used.

The data above the do not make a distinction in consumption in classes with thermal power of 50-100 MW and 100-300 MW. But this is the case in the EEC directive. So a distribution over these classes is needed as well (at least for coal combustion). The assumptions made are given as well in the next table.
It should be noted that the assumptions on the distribution are very important. They decide to a large extent the results (future emissions and costs).

Table 7.4.A. Assumed distribution of combustion of fuel oil over large plants (furnaces)

Assumed distribution (%) Heavy fuel oil	Capacity furnaces (MWth) (1983) < 50 MW	50-100	100-300	>300	Total PJ
	Calculated	Remaining	Estimiate	Calculate	Fuel oil
Germany	42	33	10	14	501.9
France	0	30	40	30	464.2
Belgium	23	29	35	13	74.5
Netherlands	33	42	25	0	56.2
Denmark	76	24	0	0	49.8
U.K.	28	37	20	14	346.8
Ireland	97	0	0	3	38.6
Spain	48	27	15	10	327.6
Portugal	46	29	25	0	79.9
Greece	45	30	25	0	96
Luxemburg	100	0	0	0	3.7
Italy	48	21	15	16	526.6

Table 7.4.B. contains the corresponding data on coal consumption. These figures are used in the case of combustion of derived coal as well because of lack of appropriate data.

Table 7.4.B. Assumed distribution of combustion of coal over large plants (furnaces). 1983

Assumed country	"Data" Capacity furnaces) (MWth) coal < 50	50 - 100	100-300	> 300
Germany	47	7	16	95
France	41	25	34	87.7
Belgium	50	25	25	38.1
Netherlands	0	100		1
Denmark	75	10	15	19.7
U.K.	40	30	20	144.3
Ireland	60		40	2.7
Spain	75	25		22.4
Portugal	100			1.4
Greece	100			4
Luxemburg	50	25	25	9.7
Italy	85	15		17.2

Next step is to estimate the future distribution. It is taken into account that:
the absolute amount of oil/coal combusted in small (< 50 MWth) furnaces and in furnaces with a capacity between 100 and 300 MWth will be constant over time. This is also true for large (> 300 MWth) furnaces. Except if a decrease in total fuel consumption is larger than the absolute amount burned in large furnaces in 1980. In that case the future consumption in that power class will be zero.

Table 7.5.A. Future distribution. Heavy fuel oil.

Assumed distribution (%), Capacity furnaces (th)(1995)						
	< 50	50-100	100-300	> 300	consumption PJ 1995	1983
Germany	68	16	16	0	310	501.9
France	0	15	85	0	218	464.2
Belgium	21	34	33	12	80	74.5
Netherlands	32	44	24	0	58.6	56.2
Denmark	76	24	0	0	50	49.8
U.K.	42	29	30	0	234	346.8
Ireland	44	55	0	1	85.6	38.6
Spain	31	53	10	7	505	327.6
Portugal	34	48	18	0	110.5	79.9
Greece	43	33	24	0	101	96
Luxemburg	88	12	0	0	4.2	3.7
Italy	75	2	23	0	364	562.6

Table 7.5.B. Future distribution. Coal.

Assumed future Country	Data" Capacity furnaces (MWth) < 50	50-100	100-300	> 300	coal consumption PJ 1995	1983
Germany	30	30	20	20	95	310
France	50	20	20	10	87.7	234
Belgium	50	25	25		38.6	63
Netherlands	25	75			1	29.3
Denmark	75	10	15		19.7	29
U.K.	40	30	20	10	144.3	177.6
Ireland	60	20	20		2.7	16.7
Spain	65	25	10		22.4	49
Portugal	100				1.4	9
Greece	50	50			4	33
Luxemburg	50	25	25		9.7	12.6
Italy	55	25	20		17.2	134

The figures of table 7.5.B. have also been used in the calculation of emissions and costs of abatement for derived coal.

7.2.3. Thermal power and size distribution

The figures for the distribution of the consumption over classes of capacities are important with regard to the calculation of the amount of emission to be abated. However, for a calculation of costs they are not sufficient. Costs i.e. investments depend on thermal power. With other words; the operating hours of a plant are important. Abatement is cheaper (costs per ton abated) in the case of long operating hours (large plant). In literature on costs investments are mostly given in relation with thermal (or electric) power and in some cases more precisely in relation to volumes of flue gas. An assumption of operating hours per power class is therefore necessary. These assumptions are shown below. They are not differentiated to country or fuel type. This could be easily done in the same way as is done with the distribution of consumption over power classes.

< 50 MWth	4000 hr/yr
50 - 100 MWth	4500 hr/yr
100 - 300 MWth	5000 hr/yr
> 300 MWth	5700 hr/yr

7.3. The EC-Directives and costs (investments)

7.3.1. Introduction

The assumptions are that after 1980 the stock of existing plants will be renewed with a rate of 5% (of the stock in 1980) per year (lifetime of a plant 20 year) and that in case of new plants, built after 1980, 66% (10/15) will be built in the period between 1985 and 1995.
With the help of assumptions for operating hours and thermal efficiency (90%) the amount of combusted fuel in these new plants can be calculated as well as the emissions to be abated. The costs of abatement depend to a large extent on the thermal capacity of the new plants.
For Germany and the Netherlands more stringent national limit values apply. In these countries old plants wil have to diminish their emissions as well. Furthermore, some limit values are more stringent then the European one's. These differences are taken into account in calculations of abated emission and in costs.
Another difference is that in those countries different limit values are set to the emissions of FBC boilers. It was therefore necessary to make assumptions of the fuels combusted in that kind of furnace.

7.3.2. Abatement techniques

It is assumed that two possibilities exist for abatement: Dry Sorbent Injection (DSI) and Spray Drying Process (SDP). Use of the low sulphur oil is considered as too expensive[2]). With DSI costs are of the same

oil is considered as too expensive[2]). With DSI costs are of the same order of magnitude as SDP but fluegas desulphuration tends to be more expensive. Wet FGD is a technique which tends to be attractive when problems exist concerning the amount of waste produced by the abatement processes. Moreover, costs tend to be low in case of very large combustion plants (> 500 MWth). This technique therefore is applicated mainly in the power generation sector (electricity works).
The costs of abatement of SO_2 emissions of FBC-boilers are very low and therefore not taken into account.
Dry sorbent injection is cheapbut the abatement efficiency of the process is only around 50%. This is sufficient in case of furnaces with a thermal capacity smaller than 300 MWth; for which a limit value applies of 400 mg/m³. In the case of furnaces with larger capacities SDP was chosen as the relevant technique. In both cases the investments as well as annual costs depend on the thermal capacity so assumptions have to be made on the actual capacity of the furnaces. It is assumed that 200 MWth and 350 MWth are the characteristic sizes of the furnaces in both capacity classes. Tables 7.6.A and B. contain the figures from Remmers & Renz (1986) which are used.

Table 7.6.A. Spec. cap. Investment (DM/(m³/hr)

(Flue Gas Volume (m³/hr)) Process	25000	50000	100000	150000	200000
DSI	20-35	17-30	15-29	14-28	13-27
Spray Drying	126-240	86-134	56-134	44-117	42-109
Wet pocesses	66-138	45-106	105-166	92-152	86-146

Flue gas (wet) stream of oil is ca. 1000 m³/kg.hr
From these data the following estimates have been made.

Table 7.6.B.

(Flue Gas Volume (m³/hr)) Process	25000	50000	100000	150000	200000
DSI	27	23	22	21	20
Spray Drying	180	125	100	80	70
Wet processes	100	75	90	120	115

DSI = Direct Sorbent Injection
In case of oil combustion, investment in ESP or baghouses should be added.

---

[2]) Except for Germany and the Netherlands. In these countries limit values apply for the sulphur content of heavy fuel oil. Costs are around 1000 DM per ton abated SO_2.

Wet FGD is cheaper than SDP only for small furnaces. These are not relevant for the EEC-directive. (However, they can be important for FRG and other countries where a more stringent abatement policy is carried out.)

7.3.3. Emissions and investments

With the above mentioned assumptions the amount of fuel, consumed in the relevant plants to which limit values apply, and size (power class) can be calculated. These data, together with an assumption of the future sulphur content of the fuels (the reference), are used to calculate the emissions to be abated.
The calculation of the investments is possible after making assumptions for the thermal capacities of the plants. For each power class (50 - 100 MWth, 100-300 MWth, and > 300 MWth) a typical size is assumed:

Power class	Typical size (MWth)
< 100 MWth	75
100 - 300 MWth	200
> 300 MWth	350

These assumptions together with the figures from Remmers & Rentz (tables 7.6.A and B) and the data for the specific flue gas volumes calculated from the physical-chemical fuel characteristics result in the investments.
In tables 7.7.A, B and C the results of the process of assuming and calculating are summarized. It is stressed that results - abated emissions and cummulative investments - depend to a large extent on the assumptions made for the distribution of the fuel consumption over classes of power (see tables 7.4.A and B). The figures of tables 7.7.A. B and C should therefore be interpreted as indications. They have only a meaning as orders of magnitude.

Table 7.7.A. Results. Emissions and costs (cumulated investment 1985-1995) for abatement of emissions from combustion of coal in large (> 50 MWth) furnaces.

	Coal PJ/yr	Coal 1995 PJ/yr	Sulphur %	Emission kt/yr	Abated kt/yr	Cum. inv. Million DM
France	87.7	234	0.9	67	15	204
Belgium	38.6	63	1	21	4	50
Denmark	19.7	29	1.3	12	2	5
U.K.	144.3	177.6	1.5	71	38	166
Ireland	2.7	16.7	1.3	7	2	7
Spain	22.4	49	1.2	22	4	22
Portugal	1.4	9	1.2	4	0	0
Greece	4	33	1	13	1	33
Luxemburg	9.7	12.6	0.8	3	0	0
Italy	17.2	134	0.8	42	3	46
Netherlands	1	29.3	0.8	9	6	0
Germany	95	310	1.0	113	100	651

It is clear that Germany - as expected because of the more severe environmental policy - takes the burden of emission abatement, both in terms of abated emission as in terms of costs.

Table 7.7.B. Results. Emissions and costs (cumulated investment 1985-1995) for abatement of emissions from combustion of derived coal in large (> 50 MWth) furnaces.

	Derived Coal PJ/yr	1995 PJ/yr	Sulphur %	Emission kt/yr	Abated kt/yr	Cum. inv. Million DM
France	241	134	0.8	10	4	30
Belgium	131	79	0.4	5	0	0
Denmark	2.7	0	0.8	0	0	0
U.K.	102.7	55	0.8	2	0	3
Ireland	0.1	0	0.8	0	0	0
Spain	66.7	146.4	0.8	124	22	90
Portugal	7.7	49.3	1	20	0	0
Greece	7.1	0	0.8	0	0	0
Luxemburg	45.4	33.5	0.8	6	0	0
Italy	140	71	0.8	7	2	25
Netherlands	38.2	29.3	0.8	8	1	9
Germany	614	247	0.3	31	20	295

Table 7.7.C. Results. Emissions and costs (cumulated investment 1985-1995) for abatement of emissions from combustion of heavy fuel oil in large (> 50 MWth) furnaces.

	Cons. PJ-1980	Cons. PJ-1995	Sulphur Cont.%	Emission kt/yr	Abated* kt/yr	Cum. Inv. Million DM
Germany	502	310	0.8	116	0	0**
France	464	218	2.9	230	85	232
Belgium	75	80	2.0	62	18	89
Netherlands	56	59	1.5	38	6	56***
Denmark	50	50	2.5	58	4	17
U.K.	347	234	3.4	354	42	93
Ireland	39	86	3.4	108	36	92
Spain	328	505	3	553	201	584
Portugal	80	111	2.3	99	27	117
Greece	96	101	3	122	29	81
Luxembourg	4	4	1.5	3	0	1
Italy	563	364	3.5	584	50	105

* Not abated emissions if low sulphur oil used.

** Annual costs of low sulphur oil are 175 million DM. Reference 2,0% S in oil. DM 1000 per tonne abated SO_2 emission. Germany abated: 175 kt/yr.

*** Annual costs of low sulphur oil are 30 million DB. Abated 30 kt/yr, no investments.

In the case of fuel oil combustion Germany is less important. The United Kingdom and southern Europe, especially Spain[3]), are important for the emissions.

7.4. Sensitivity of results with respect to the emissions standards for new industrial plants

Table 7.8.A. presents the costs, investments as well as emission abated as calculated in the main report. In the main report FGD on new power plants and if needed FGD on existing power plants was the main abatement strategy.

Table 7.8.A. Investments and costs of reducing SO_2 emissions (in million ECU's in 1985 prices)

Country	Investments (1985-1995)	Annual costs (1995)	Emission abated (kton)	Costs per ton abated (ECU/ton)
Belgium	238	45.9	67	685
Denmark	436	94.6	201	471
France	0	0	0	0
FRGermany*	4769	976.6	1716	569
Greece	31	10.9	25	436
Ireland	168	39.6	64	619
Italy	2319	438.9	753	583
Luxembourg	0	0	0	0
Netherlands	633	128.2	256	501
Portugal	0	0	0	0
Spain	500	92.5	180	514
United Kingdom	3160	628.0	1344	467
EC	12253	2455	4606	533

* Excluding measures taken before 1985

Table 7.8.B. shows the results of a sensitivity analysis. The estimate made for the costs and emission reduction of emissions standards for new industrial plants (using data and additional assumptions on fuel use, sulphur content, other fuel characteristics, size distribution, average size of the plant, operating hours and the expected abatement technology in the previous sections) is thus included.
Dry sorbent injection is likely in industrial plants between 100 - 300 MWth and spray drying for these plants larger than 300 MWth. It was assumed that application of these emission standards reduces the necessity to apply FGD on existing power plants which, for some countries was needed to meet the bubble. The total investments as well as a more

[3]) In the case Spain this is mainly due to the high fuel oil use foreseen in the IEA scenario (IEA, 1986).

tentative calculation of abatement costs and the final emission reduction are shown in table 7.8.B.[4])

Table 7.8.B. Investments and costs of reducing SO_2 emissions if emission standards for new industrial plants are accounted for (in million ECU's in 1985 prices)

Country	Investments		Annual costs	Emission abated
	New Industrial Plants (1985-1995)	Total (all LCP) (1985-1995)	(all LCP) (1995)	(all LCP) (kton)
Belgium	60	218	46	67
Denmark*	10	437	103	201
France	209	209	52	104
FRGermany**	425	4769	976.6	1716
Greece***	51	82	24	55
Ireland	108	26	24	64
Italy	79	2225	426	753
Luxembourg	0.5	0.5	0.1	0
Netherlands	29.2	665	131	256
Portugal***	53	53	13	27
Spain	313	574	126	227
United Kingdom	118	3088	619	1344
EC	1456	12347	2455	4606

* Emission standards EC replace limit values own policy

** No difference in total since own policy more stringent

*** Only if emission standards are applied and bubble concept (increase granted) is neglected

As can be seen from the differences betwee tables 7.8.A. and 7.8.B., there are hardly differences for most countries in the ultimate costs, investments and emission reduction. Exceptions are:
France, since the bubble and the emission standards for industrial installations require some abatement measures. In Greece there is only a, substantial, difference if one assumes that the country is not only to respect the bubble (a standstill) but also has to comply with the emission standards for new industrial plants. The same holds for Portugal.

---

[4]) Annual costs are estimated under the assumption that the ratio between investments and annual costs as figured out in table 7.8.A. would be the same as for industrial plants. Since industrial plants are smaller, have a more restricted lifetime and operating costs are higher due to the use of DSI tentatively, costs are estimated to be 25% higher. A more detailed assessment, although technically feasible was not yet possible.

For Ireland investments and costs would be 35% lower. Reducing emissions of new industrial plants apparently being cheaper as the application of FGD on existing power plants.
For Spain costs and emissions abated would be 30% higher due to the tremendous growth in industrial energy use expected in the IEA scenario (1986); application of emission standards for new industrial and power plants being more stringent as the bubble concept only.
It should be noted that especially the assumption on the size distribution of the fuel consumption determines the results obtained. Still the approach can be useful to account for uncertainty, especially if new data for the size distribution (emission inventory CITEPA) would come available. In the latter case it could be useful to apply the methodology as well to the second stage of the Directive (up to 2000), aiming to provide an estimate of the range of costs and investments. If possible use could be made of a new energy scenario from the Directorate General Energy.

8. ABATEMENT COSTS AS PERCENTAGE OF THE GROSS DOMESTIC PRODUCT AND THE IMPACT ON ELECTRICITY PRODUCTION COSTS AND PRICES

Table 8.1 presents the abatement costs in each country as % of the 1985 GDP (Gross Domestic Product). The table compares these costs with the GDP expressed in purchasing power. When taking account of purchasing power standards costs for Belgium, Greece, Italy, Spain and the UK and more notably Portugal become less high (see table 8.2). Differences between countries are smoothened due to the fact that the purchasing power of the currency is accounted for.

Table 8.1. Costs and GDP

Country	GDP (billion ECU) 1985	Annual Costs (million ECU)		Costs as % of GDP		
		SO_2	NO_X	SO_2	NO_X	$SO_2 + NO_X$
B	104.5	45.9	2.4	0.044	0.002	0.046
DK	76.4	103.1	6.5	0.135	0.009	0.143
F	674.8	0	0	0.000	0	0.000
FRG	826.4	976.6	666.6	0.118	0.081	0.199
GR	42.8	10.6	0	0.025	0	0.025
IRE	24.1	39.6	2.8	0.164	0.012	0.176
I	556.5	438.9	188.8	0.079	0.034	0.113
L	4.7	0	0	0.000	0	0.000
NL	165.3	128.2	7	0.078	0.004	0.082
P	27.3	0	28.8	0.000	0.105	0.105
SP	216.2	92.5	4.2	0.043	0.002	0.045
UK	559	628	27.8	0.106	0.005	0.110
EEC	3314	2464	934.9	0.074	0.028	0.103

Source: GDP (Gross Domestic Product in 1985 at current prices and current exchange rates based on EUROSTAT, national accounts ESA 1960-1985; 1987)

Table 8.2. Costs and GPD and Purchasing Power Standards (PPS)

Country	GDP (billion PPS) 1985	Annual Costs (million ECU) SO_2	NO_X	Costs as % of GDP at PPS SO_2	NO_X	$SO_2 + NO_X$
B	117.1	45.9	2.4	0.039	0.002	0.041
DK	68	103.1	6.5	0.152	0.01	0.161
F	704.4	0	0	0.000	0	0.000
FRG	816	976.6	666.6	0.120	0.082	0.201
GR	64.8	10.9	0	0.017	0	0.017
IRE	26.4	39.6	2.8	0.150	0.011	0.161
I	679.9	438.9	188.8	0.065	0.028	0.092
L	5.4	0	0	0.000	0	0.000
NL	181.1	128.2	7	0.071	0.004	0.075
P	58.3	0	28.8	0.000	0.049	0.049
SP	323.7	92.5	4.2	0.029	0.001	0.030
UK	671.9	628	27.8	0.093	0.004	0.098
EEC	4041.3	2464	933.9	0.061	0.023	0.084

Source: GDP (Gross Domestic Product in 1985 at current prices and current purchasing power parities based on EUROSTAT, national accounts ESA 1960-1985; 1987)

The impact on electricity production costs and electricity prices for large scale industrial use is shown in table 8.3.

Table 8.3. Impact on Electricity Production Costs and Electricity Prices

Country	Abatement Costs[1] (in million ECU/annum) SO_2	NO_x	Electricity consumption TWh 1995	Electricity price (ECU per 100 KWh)[3]	Impact on Electricity price SO_2 (ECU per 100 KWh)	(%)[3]	NO_x (ECU per 100 KWh)	(%)[3]	SO_2 + NO_x (ECU per 100 KWh)	(%)[3]
B	45.9	2.4	66.8	5.6	0.069	1.2	0.004	0.1	0.072	1.3
DK	85.9	6.5	35.7	7.2	0.241	3.4	0.018	0.3	0.259	3.6
F	0	0	440	4.8	0.000	0.0	0.000	0.0	0.000	0.0
FRG[2]	839.4	472	448	6.0	0.187	3.1	0.105	1.8	0.293	4.9
GR	10.9	0	41.3	5.5	0.026	0.5	0.000	0.0	0.026	0.5
IRE	39.6	2.8	17.6	6.7	0.225	3.4	0.016	0.2	0.241	3.6
I	438.9	188.8	290	5.1	0.151	3.0	0.065	1.3	0.216	4.2
L	0	0	4.7	5.0	0.000	0.0	0.000	0.0	0.000	0.0
NL	128.2	7	72.7	5.8	0.176	3.0	0.010	0.2	0.186	3.2
P	0	28.8	31	6.7	0.000	0.0	0.093	1.4	0.093	1.4
SP	92.5	4.2	164.8	6.0	0.056	0.9	0.003	0.0	0.059	1.0
UK	628.3	27.8	308.8	5.6	0.203	3.6	0.009	0.2	0.212	3.8
EEC	2309.6	740.3	1921.4		0.120		0.039		0.159	

Remarks:

[1]) Only costs weighing upon the electricity sector are taken into account. Costs of industrial abatement are excluded.

[2]) Excluding costs of German measures taken before 1985

[3]) Impact on electricity prices excluding tax and VAT. Prices are based on industrial large scale use (24 GWh per year). Source:
CEC (Bulletin of energy prices no. 2, 1986). In case of Denmark prices include the deductible specific tax.

References

Amann, M., et. al., "Rains energy and emissions data", IIASA working paper, IIASA, Laxenburg, 1986.

Amann, M. and G. Kornai, "Cost functions for controlling SO_2 emissions in Europe", IIASA working paper, IIASA, Luxembourg, 1987.

Arthur, D. Little, "SO_2 emissions from large combustion units; scenario analysis", Leidschendam, 1984.

Bakema, G. and P. Kroon, "Zure regen, dure regen", Energie Studie Centrum, Petten, 1986.

Batterman S. et.al., "Optimal SO_2 abatement policies in Europe: some examples", IIASA working paper, IIASA, Luxembourg, 1987.

Beck, P. and P. Rosolski, "Abschatzung der Emissionsentwicklung stationaren Quellen 1984-1995", Umweltbundesamt, Berlin, 1986.

Bundesministerium für Wirtschaft, "Energiebericht der Bundesregierung", Bonn, 1986.

CEC, "Emissions of sulphurdioxide and nitrogenoxides in Denmark 1960-2000", Brussels, 1984a.

CEC, 'Proposal for a Council Directive in the limitation of emissions of pollutants into the air from large combustion plants (COM (85) 704 final)', Official Journal of the European Communities, No. C 49/1, 21-2-1984b, Brussel.

CEC, "Elaboration and evaluation of data on large combustion installations in the European Community", Brussels, 1986.

CEC, "The Community Energy outlook to 1995; a preliminary reexamination", (internal document), Brussels, 1987a.

CEC, "Data received from CEC in on past and future emissions in member states", Brussels, 1987b.

CEC, 'Proposition modificé de directive du Conseil relative à la limitation des émissions de pollutants dans l'atmosphère en provenance des Grandes Installations de combustion (COM (85) 47 final)', Journal officiel des Communantés Européennes, No. C 76/6, 22-3-1985, Bruxelles.

CITEPA, "Data on emission factors and fuel distribution as collected in the frame of an EEC emission inventory" (unpublished), Paris, 1986.

Commission of the European Communities, Bulletin of energy prices, no. 2-1986, Brussels-Luxembourg, 1986.

Cooper, J., P. Eaves, W. Halstead, W. Kyte and C. Oxley, "Pilot plant for removal of chloride from flue gas", 6th International conference and exhibition on coal technology and coal economics, London, 1987.

Concawe, "Direct Desulphurization of residual petroleum oil - investments and operating costs", 's-Gravenhage, 1981.

Department of the Environment, "Review of strategies and policies of the contracting parties to the convention, United Kingdom response", UNECE Convention on long range transboundary air pollution, London, 1986.

Department of the Environment, "Digest of environmental protection and water statistics", HMSO, London, 1983.

Elam, N., "Potential for reduction of sulphur content in petroleum products in Northwest Europe", Atrax Energie AB, Gothenburg, 1985.

ENEA, "Energia e innovazione, Conferenza national sull 'energia", 1987.

European Community Commission proposal for a Council Directive on limiting emissions from large combustion plants (COM (83) 704 final), International environment reporter, 1-11-84, Bureau of national affairs, Washington.

EUROSTAT, "Energy statistics yearbook 1980, EUROSTAT, Luxembourg, 1982.

EUROSTAT, "Review 1976-1985", EEC, Brussels, 1987.

EUROSTAT, "National accounts ESA, 1960-1985", EEC, Brussels, 1987.

Guilmot, J.F., D. McGlue, P. Valette and C. Waterloos, "Energy 2000: A reference projection and alternative outlooks for the European Community and the world in the year 2000, CEC, Cambridge University Press, 1986.

Halbritter G., et.al., Weitraumige Verteilung von Schwefelemissionen, Teil II, "STAUB Reinhaltung der Luft", Band 45, nr. 5, 1985.

Hoogervorst, N., "Voorlopige emissiescenario's voor 1980, 1990 en 2000 van SO_2 en NO_x in België, West-Duitsland, Frankrijk en het Verenigd Koninkrijk", (concept), Agricultural University, Wageningen, 1985.

IEA, "Energy statistics 1971/1981", OECD, Paris, 1983.

IEA, "Energy policies and programmes of IEA countries, 1985 review, Paris, 1986.

IVM, "Scenario's voor vier milieu gevaarlijke stoffen in 2000", Amsterdam, 1986.

Keizer, V., Besluit emissie eisen stookinstallaties, "Lucht en Omgeving", 5/1987.

Lange, M., and N. Haug, "Application and effectiveness of flue gas desuphurization and denitrification processes in the Federal Republic of Germany", ECE fourth seminar on the control of sulpher and nitrogen oxides from stationary sources, Graz, 1986.

Lange, M., SO_2 und NO_x Emissionsminderung bei stationären Anlagen, "STAUB, Reinhaltung der Luft" september 1986 nr. 9.

Lange, M. and P. Davids, "Die Grossfeueranlagen Verordnung; Technischer Kommentar", VDI Verlag, Düsseldorf, 1984.

Ministerie VROM, "Financiële en economische aspecten van het milieubeleid; bundel met achtergrondinformatie voor het IMPM 1986-1990, Leidschendam, 1985.

Ministerie VROM, "Toelichting berekening emissiebeperking en kosten van de Amvb grote vuurhaarden", Leidschendam, 1985.

Muzio, L.J. and G.R. Offen, "Dry sorbent emission control technologies", JAPCA. 32, p. 642-654.

OECD, "Understanding pollution abatement cost estimates", Paris, 1986.

OECD, "Main economic indicators", February 1987, Paris, 1987.

Remmers, J. and O. Rentz, "Measures and costs to reduce SO_2 and NO_x emissions with special regard to industry", (Proceedings conference Energy and Clean air OECD/ENEA), Taormina, 1986.

Rijck, Th. de, and W. van Hove, "Evolutie en prognose van de SO_2 uitworp in België". Leefmilieu 6/6, p. 175-183.

Schärer, B. and K. Keiter "Costs and benefits of reducing emissions from large firing installations in the Federal Republic of Germany", background paper prepared for the ECE group of experts on cost benefit analysis, Berlin, 1986.

Schärer, B. and N. Haug, "The costs of flue gas desulphurization and denitrification in the Federal Republic of Germany", ECE fourth seminar on the control of sulphur and nitrogenoxides from stationary sources, Graz, 1986b.

Schulenburg, Die wirtschaftliche Situation der Industriellen Kraftwirtschaft, "VGB Kraftwerkstechnik", Heft 8, august 1985.

Schweers, K., "An international comparison of the economics of sulphur removal by sorbent injection in existing power plants" (Proceedings conference Energy and Clear Air OECD/ENEA), Taormina, 1986.

Schulz, W., I. Hoven and P. Suding, "The possibility of financial interventions by the Commission to promote pollution control of large combustion installations in certain member countries (i.e. UK, Gr, Ire, Sp, P) faced with circumstances of a particular nature", Energiewirtschaftliches Institut an der Universität Köln, Köln, 1986.

Semi-Metra Conseil and CITEPA, "Les marches induits par le project de directive sur les grandes installations de combustion et l'aptitude de l'offre Européene à les satisfaire", Paris, 1985.

Tangena, B.H., "Optimalisatie bestrijding verzuring", Ministerie VROM, Leidschendam, 1985.

Technica, "Optimalisation of abatement of acidifying emissions", Ministerie VROM, London, 1984.

Technische Advies Commissie, "Advies over zwaveldioxyde", Ministerie VROM, 's-Gravenhage, 1984.

Technische Advies Commissie, "Technologische gegevens voor het NO_x beleid", Ministerie VROM, 's-Gravenhage 1985.

UNIPEDE, "Programmes and prospects of the electricity sector; 1985-1991 and 1991-2000", Paris, 1987.

Umwelt, "Was leistet die Grossfeueranlagen Verordnung?", Umwelt nr. 5, august 1985.

Umwelt, "TA Luft 1985 vom Bundeskabinett verabschiedet", Umwelt nr. 5, august 1985.

ANNEX

DATA ON FUEL USE AND EMISSIONFACTORS							
COUNTRY:	BELGIUM						
ENERGY-USE	YEAR:	1980		ENERGY-USE	YEAR:	1995	
(PJ)				(PJ)	ENERGY 2000 en detail + UNIPEDE 1987		
Sector	Power	Convers.	Industry	Sector	Power	Convers.	Industry
Fuel	Plants			Fuel	Plants		
SOLIDS	155.3	22.2	204.4	SOLIDS	188	0	142.4
Hard Coal	124.8	0.3	38.6	Hard Coal	163	0	63
Brown coal	0	0	0	Brown coal	0	0	0
Der. solid	0	0.1	131.5	Der. solid	0	0	79
Der. gaseous	30.5	21.8	34.3	Der. gaseous	25	22	35
GAS	66.4	11.3	124.2	GAS	0	33	108.9
Natural gas	66.4	11.3	124.2	Natural gas	0	11	71
PETROL PRO.	170.5	75.4	103.4	PETROL PRO.	59	50.2	125.6
Ref.gas	2.5	29.3	2.2	Ref.gas	0	24	2.67
Lpg	0	0.9	2.2	Lpg	0	1	13
Res. fuel oil	167.8	30	74.5	Res. fuel oil	59	24	80
Gas/dieseloil	0.2	2.9	24.5	Gas/dieseloil	0	0	35
Motorspirit	0	0	0	Motorspirit	0	0	0
Jet fuel/kero	0	0	0	Jet fuel/kero	0	0	0
other	0	12.3	0	other	0	0	0
TOTAL	392.2	108.9	432	TOTAL	247	83.2	376.9
EMISSIONFACTORS:		SO2	1995	EMISSIONFACTORS:		NOx	1995
(TON/PJ)				(TON/PJ)			
Sector	Power	Convers.	Industry	Sector	Power	Convers.	Industry
Fuel	Plants			Fuel	Plants		
SOLIDS	0	0	0	SOLIDS	0	0	0
Hard Coal	567	567	567	Hard Coal	285	0	277
Brown coal	0	0	0	Brown coal	0	0	277
Der. solid	260	0	260	Der. solid	0	0	277
Der. gaseous	260	260	260	Der. gaseous	0	127	91
GAS	0	0	0	GAS	0	0	0
Natural gas	0	0	0	Natural gas	180	127	0
PETROL PRO.	0	0	0	PETROL PRO.	0	0	0
Ref.gas	0	10	0	Ref.gas	180	127	91
Lpg	0	10	0	Lpg	180	127	91
Res. fuel oil	1667	1395	952	Res. fuel oil	145	175	171
Gas/dieseloil	238	238	238	Gas/dieseloil	145	175	171
Motorspirit	0	0	0	Motorspirit	0	0	0
Jet fuel/kero	0	0	0	Jet fuel/kero	0	0	0
other		0	0	other	0	0	0

DATA ON FUEL USE AND EMISSIONFACTORS							
COUNTRY:	DENMARK						
ENERGY-USE	YEAR:	1980		ENERGY-USE	YEAR:	1995	
(PJ)				(PJ)	ENERGY 2000 en detail + UNIPEDE 1987		
Sector	Power	Convers.	Industry	Sector	Power	Convers.	Industry
Fuel	Plants			Fuel	Plants		
SOLIDS	211.9	0.3	22.8	SOLIDS	326	0	29
Hard Coal	211.9	0	19.7	Hard Coal	326	0	29
Brown coal	0	0	0	Brown coal	0	0	0
Der. solid	0	0.2	2.7	Der. solid	0	0	0
Der. gaseous	0	0.1	0.4	Der. gaseous	0	0	0
GAS	0	0	0	GAS	0	0	25
Natural gas	0	0	0	Natural gas	0	0	25
PETROL PRO.	49.5	13.6	84.9	PETROL PRO.	8	33	67
Ref.gas	0	10.1	0	Ref.gas	0	24.9	0
Lpg	0	0	4.6	Lpg	0	0	0
Res. fuel oil	49.2	3.6	49.8	Res. fuel oil	8	8.9	50
Gas/dieseloil	0.3	0	29	Gas/dieseloil	0	0	17
Motorspirit	0	0	1.3	Motorspirit	0	0	0
Jet fuel/kero	0	0	0.2	Jet fuel/kero	0	0	0
other	0	0	0	other	0	0	
TOTAL	261.4	13.9	107.7	TOTAL	334	33	121
EMISSIONFACTORS:		SO2	1995	EMISSIONFACTORS:		NOx	1995
(TON/PJ)				(TON/PJ)			
Sector	Power	Convers.	Industry	Sector	Power	Convers.	Industry
Fuel	Plants			Fuel	Plants		
SOLIDS	0	0	0	SOLIDS	0	0	0
Hard Coal	713	843	843	Hard Coal	471	0	360
Brown coal	0	0	0	Brown coal	0	0	0
Der. solid	519	0	519	Der. solid	0	0	360
Der. gaseous	519	519	519	Der. gaseous	0	70	70
GAS	0	0	0	GAS	0	0	0
Natural gas	0	0	0	Natural gas	0	0	70
PETROL PRO.	0	0	0	PETROL PRO.	0	0	0
Ref.gas	0	10	0	Ref.gas	0	70	70
Lpg	0	10	0	Lpg	0	70	70
Res. fuel oil	1190	1320	1190	Res. fuel oil	263	260	211
Gas/dieseloil	238	238	238	Gas/dieseloil	263	260	211
Motorspirit	0	0	0	Motorspirit	0	0	0
Jet fuel/kero	0	0	0	Jet fuel/kero	0	0	0
other		0	0	other	0	0	0

. DATA ON FUEL USE AND EMISSIONFACTORS							
COUNTRY:	FRANCE						
ENERGY-USE	YEAR:	1980		ENERGY-USE	YEAR:	1995	
(PJ)				(PJ)	ENERGY 2000 en detail + UNIPEDE 1987		
Sector	Power	Convers.	Industry	Sector	Power	Convers.	Industry
Fuel	Plants			Fuel	Plants		
SOLIDS	662.4	44.6	428.1	SOLIDS	295	4.20	368.5
Hard Coal	565.1	6.1	87.8	Hard Coal	180	4.20	234
Brown coal	30.7	0	3.1	Brown coal	0	0.00	0
Der. solid	0	1.5	240.7	Der. solid	0	0.00	134
Der. gaseous	66.6	37	96.5	Der. gaseous	33	26.37	15
GAS	55.3	10	313.5	GAS	0	33.50	415
Natural gas	55.3	10	313.5	Natural gas	0	7.13	350
PETROL PRO.	463.1	265.3	786.4	PETROL PRO.	54	238.70	415
Ref.gas	4.5	124.9	4.1	Ref.gas	0	117.47	50
Lpg	0	5.2	34.4	Lpg	0	4.70	17
Res. fuel oil	442.6	123.8	464.2	Res. fuel oil	54	116.53	218
Gas/dieseloil	2.2	0.8	231.4	Gas/dieseloil	0	0.00	80
Motorspirit	0	0	0	Motorspirit	0	0.00	0
Jet fuel/kero	0	0	1.5	Jet fuel/kero	0	0.00	0
other	13.8	10.6	50.8	other	13	0.00	0
TOTAL	1181	319.9	1528	TOTAL	349	276.4	1198.5
EMISSIONFACTORS:		SO2	1995	EMISSIONFACTORS:		NOx	1995
(TON/PJ)				(TON/PJ)			
Sector	Power	Convers.	Industry	Sector	Power	Convers.	Industry
Fuel	Plants			Fuel	Plants		
SOLIDS	0	0	0	SOLIDS	0	0	0
Hard Coal	616	584	584	Hard Coal	283	0	225
Brown coal	426	0	0	Brown coal	0	0	225
Der. solid	519	242.2	519	Der. solid	283	0	225
Der. gaseous	519	519	519	Der. gaseous	272	103	104
GAS	0	0	0	GAS	0	0	0
Natural gas	0	0	0	Natural gas	272	103	104
PETROL PRO.	0	0	0	PETROL PRO.	0	0	0
Ref.gas	0	5	0	Ref.gas	272	103	104
Lpg	0	5	0	Lpg	272	103	104
Res. fuel oil	1676	1290	1380	Res. fuel oil	163	118	145
Gas/dieseloil	238	238	238	Gas/dieseloil	163	118	145
Motorspirit	0	0	0	Motorspirit	0	0	0
Jet fuel/kero	0	0	0	Jet fuel/kero	0	0	0
other		0	0	other	0	0	0

DATA ON FUEL USE AND EMISSIONFACTORS							
COUNTRY:	FEDERAL REPUBLIC OF GERMANY						
ENERGY-USE	YEAR:	1980		ENERGY-USE	YEAR:	1995	
(PJ)				(PJ)	ENERGY 2000 en detail + UNIPEDE 1987		
Sector	Power	Convers.	Industry	Sector	Power	Convers.	Industry
Fuel	Plants			Fuel	Plants		
SOLIDS	2203	117.9	935	SOLIDS	2300	33.5	557
Hard Coal	1101	20.5	94.6	Hard Coal	1338	31	310
Brown coal	968.2	1.3	16.4	Brown coal	920	0	0
Der. solid	20.1	1.7	614.2	Der. solid	0	2	247
Der. gaseous	113.3	94.4	209.8	Der. gaseous	42	119.73	180
GAS	559.5	51.8	617.5	GAS	209	184.2	787.2
Natural gas	559.5	51.8	617.5	Natural gas	209	64.47	603
PETROL PRO.	236.3	337.5	767.6	PETROL PRO.	167	239	494
Ref.gas	10.6	177.7	3.6	Ref.gas	0	133.84	4
Lpg	0	0.4	35.2	Lpg	0	0	17
Res. fuel oil	225.5	142.2	501.9	Res. fuel oil	125	81.26	310
Gas/dieseloil	0.2	2.8	225.6	Gas/dieseloil	0	0	159
Motorspirit	0	0	0	Motorspirit	0	0	0
Jet fuel/kero	0	0	1.3	Jet fuel/kero	0	0	0
other	0	14.4	0	other	42	0	0
TOTAL	2999	507.2	2320.1	TOTAL	2676	456.7	1838.2
EMISSIONFACTORS:		SO2	1995	EMISSIONFACTORS:		NOx	1995
(TON/PJ)				(TON/PJ)			
Sector	Power	Convers.	Industry	Sector	Power	Convers.	Industry
Fuel	Plants			Fuel	Plants		
SOLIDS	0	0	0	SOLIDS	0	0	0
Hard Coal	891	686	686	Hard Coal	315	0	316
Brown coal	589	393	393	Brown coal	315	0	316
Der. solid	553	24.35	207	Der. solid	315	0	316
Der. gaseous	553	207	207	Der. gaseous	230	163	184
GAS	0	0	0	GAS	0	0	0
Natural gas	0	0	0	Natural gas	230	163	184
PETROL PRO.	0	0	0	PETROL PRO.	0	0	0
Ref.gas	0	35	0	Ref.gas	230	163	184
Lpg	0	35	0	Lpg	230	163	184
Res. fuel oil	1500	990	457	Res. fuel oil	197	171	170
Gas/dieseloil	143	143	143	Gas/dieseloil	197	171	170
Motorspirit	0	0	0	Motorspirit	0	0	0
Jet fuel/kero	0	0	0	Jet fuel/kero	0	0	0
other		0	0	other	0	0	0

DATA ON FUEL USE AND EMISSIONFACTORS							
COUNTRY:	GREECE						
ENERGY-USE	YEAR:	1980		ENERGY-USE	YEAR:	1995	
(PJ)				(PJ)	ENERGY 2000 en detail + UNIPEDE 1987		
Sector	Power	Convers.	Industry	Sector	Power	Convers.	Industry
Fuel	Plants			Fuel	Plants		
SOLIDS	105.7	1.3	19.7	SOLIDS	384	0.0	58.6
Hard Coal	0	0	4	Hard Coal	29	0.0	33
Brown coal	105.7	0	7.2	Brown coal	355	0.0	26
Der. solid	0	0	7.1	Der. solid	0	0.0	0
Der. gaseous	0	1.3	1.4	Der. gaseous	0	0.0	0
GAS	0	0	0	GAS	0	0.0	4
Natural gas	0	0	0	Natural gas	0	0.0	4
PETROL PRO.	87.8	19.5	107.4	PETROL PRO.	29	16.7	129.8
Ref.gas	0	8.9	0	Ref.gas	0	7.6	0
Lpg	0	0	1.8	Lpg	0	0.0	4
Res. fuel oil	74.8	10.6	96	Res. fuel oil	29	9.1	101
Gas/dieseloil	13	0	9.6	Gas/dieseloil	0	0.0	24
Motorspirit	0	0	0	Motorspirit	0	0.0	0
Jet fuel/kero	0	0	0	Jet fuel/kero	0	0.0	0
other	0	0	0	other	0	0.0	0
TOTAL	193.5	20.8	127.1	TOTAL	413	16.7	192.4
EMISSIONFACTORS:		SO2	1995	EMISSIONFACTORS:		NOx	1995
(TON/PJ)				(TON/PJ)			
Sector	Power	Convers.	Industry	Sector	Power	Convers.	Industry
Fuel	Plants			Fuel	Plants		
SOLIDS	0	0	0	SOLIDS	0	0	0
Hard Coal	648	648	648	Hard Coal	88	88	88
Brown coal	2023	2407	2407	Brown coal	88	88	88
Der. solid	0	620	620	Der. solid	88	88	88
Der. gaseous	0	620	620	Der. gaseous	0	15	0
GAS	0	0	0	GAS	0	0	0
Natural gas	0	0	0	Natural gas	0	100	80
PETROL PRO.	0	0	0	PETROL PRO.	0	0	0
Ref.gas	0	10	0	Ref.gas	0	155	0
Lpg	0	10	0	Lpg	0	0	0
Res. fuel oil	714	1460	1429	Res. fuel oil	145	120	120
Gas/dieseloil	476	476	476	Gas/dieseloil	60	60	45
Motorspirit	0	0	0	Motorspirit	0	0	0
Jet fuel/kero	0	0	0	Jet fuel/kero	0	0	0
other		0	0	other	0	0	0

DATA ON FUEL USE AND EMISSIONFACTORS							
COUNTRY:	IRELAND						
ENERGY-USE	YEAR:	1980		ENERGY-USE	YEAR:	1995	
(PJ)				(PJ)	ENERGY 2000 en detail + UNIPEDE 1987		
Sector	Power	Convers.	Industry	Sector	Power	Convers.	Industry
Fuel	Plants			Fuel	Plants		
SOLIDS	26.4	0	3.6	SOLIDS	109	0	16.7
Hard Coal	1	0	2.7	Hard Coal	71	0	16.7
Brown coal	25.4	0	0.1	Brown coal	38	0	0
Der. solid	0	0	0.1	Der. solid	0	0	0
Der. gaseous	0	0	0.7	Der. gaseous	0	0	0
GAS	16.1	0.1	14.6	GAS	0	0	16.7
Natural gas	16.6	0.1	14.6	Natural gas	0	0	16.7
PETROL PRO.	59	2.8	51.5	PETROL PRO.	63	4.2	71.2
Ref.gas	0	2	0	Ref.gas	0	3	0
Lpg	0	0.5	1.6	Lpg	0	0.75	4.2
Res. fuel oil	59	0.3	38.6	Res. fuel oil	63	0.45	85.6
Gas/dieseloil	0	0	10.9	Gas/dieseloil	0	0	8.4
Motorspirit	0	0	0	Motorspirit	0	0	0
Jet fuel/kero	0	0	0.4	Jet fuel/kero	0	0	0
other	0	0	0	other	0	0	0
TOTAL	101.5	2.9	69.7	TOTAL	172	4.2	104.6
EMISSIONFACTORS:		SO2	1995	EMISSIONFACTORS:		NOx	1995
(TON/PJ)				(TON/PJ)			
Sector	Power	Convers.	Industry	Sector	Power	Convers.	Industry
Fuel	Plants			Fuel	Plants		
SOLIDS	0	0	0	SOLIDS	0	0	0
Hard Coal	843	843	843	Hard Coal	255	0	415
Brown coal	843	843	843	Brown coal	255	0	415
Der. solid	0	776	776	Der. solid	255	0	415
Der. gaseous	0	776	776	Der. gaseous	180	0	150
GAS	0	0	0	GAS	0	0	0
Natural gas	0	0	0	Natural gas	180	0	150
PETROL PRO.	0	0	0	PETROL PRO.	0	0	0
Ref.gas	0	0	0	Ref.gas	180	0	150
Lpg	0	0	0	Lpg	180	0	150
Res. fuel oil	1619	1619	1619	Res. fuel oil	308	0	155
Gas/dieseloil	467	467	467	Gas/dieseloil	308	0	155
Motorspirit	0	0	0	Motorspirit	0	0	0
Jet fuel/kero	0	0	0	Jet fuel/kero	0	0	0
other		0	0	other	0	0	0

DATA ON FUEL USE AND EMISSIONFACTORS							
COUNTRY:	ITALY						
ENERGY-USE	YEAR:	1980		ENERGY-USE	YEAR:	1995	
(PJ)				(PJ)	ENERGY 2000 en detail + UNIPEDE 1987		
Sector	Power	Convers.	Industry	Sector	Power	Convers.	Industry
Fuel	Plants			Fuel	Plants		
SOLIDS	169.1	35.2	207.2	SOLIDS	1003	0	205.2
Hard Coal	123.7	0	17.2	Hard Coal	957	0.0	134.0
Brown coal	13.5	0	0.7	Brown coal	0	0.0	0.0
Der. solid	0	2.9	140.1	Der. solid	0	0.0	71.0
Der. gaseous	31.9	32.3	49.2	Der. gaseous	46	44.0	24.9
GAS	81.9	7.3	382.3	GAS	167	54.0	502.4
Natural gas	81.9	7.3	382.3	Natural gas	167	10.0	440.0
PETROL PRO.	940.7	204.7	654	PETROL PRO.	673	175.9	439.6
Ref.gas	8.6	83.6	14.6	Ref.gas	0	76.3	13.0
Lpg	0	2.7	26.7	Lpg	0	2.1	25.0
Res. fuel oil	921.3	107	562.6	Res. fuel oil	627	98.0	364.0
Gas/dieseloil	10.5	0.2	19.5	Gas/dieseloil	0	0.2	50.0
Motorspirit	0	0	0	Motorspirit	0	0.0	0.0
Jet fuel/kero	0	0.2	0.9	Jet fuel/kero	0	0.2	0.0
other	0.3	11	29.7	other	46	0.0	0.0
TOTAL	1192	247.2	1243.5	TOTAL	1843	229.9	1147.2
EMISSIONFACTORS:		SO2	1995	EMISSIONFACTORS:		NOx	1995
(TON/PJ)				(TON/PJ)			
Sector	Power	Convers.	Industry	Sector	Power	Convers.	Industry
Fuel	Plants			Fuel	Plants		
SOLIDS	0	0	0	SOLIDS	0	0	0
Hard Coal	519	519	519	Hard Coal	470	225	225
Brown coal	1182	0	1182	Brown coal	470	225	225
Der. solid	519	0	519	Der. solid	470	225	225
Der. gaseous	519	519	519	Der. gaseous	45	0	0
GAS	0	0	0	GAS	0	0	0
Natural gas	0	0	0	Natural gas	175	90	90
PETROL PRO.	0	0	0	PETROL PRO.	0	0	0
Ref.gas	0	0	0	Ref.gas	200	120	200
Lpg	0	0	0	Lpg	0	0	0
Res. fuel oil	1874	1639	1639	Res. fuel oil	375	200	200
Gas/dieseloil	656	656	656	Gas/dieseloil	60	60	60
Motorspirit	0	0	0	Motorspirit	0	0	0
Jet fuel/kero	0	0	0	Jet fuel/kero	0	0	0
other		0	0	other	0	0	0

DATA ON FUEL USE AND EMISSIONFACTORS							
COUNTRY:	LUXEMBOURG						
ENERGY-USE	YEAR:	1980		ENERGY-USE	YEAR:	1995	
(PJ)				(PJ)	ENERGY 2000 en detail + UNIPEDE 1987		
Sector	Power	Convers.	Industry	Sector	Power	Convers.	Industry
Fuel	Plants			Fuel	Plants		
SOLIDS	6.4	0	69.5	SOLIDS	0	0	46.1
Hard Coal	0.3	0	9.7	Hard Coal	0	0	12.6
Brown coal	0	0	0	Brown coal	0	0	0
Der. solid	0	0	45.4	Der. solid	0	0	33.5
Der. gaseous	6.1	0	14.4	Der. gaseous	4	0	14.6
GAS	2.8	0	10.3	GAS	0	0	25.1
Natural gas	2.8	0	10.3	Natural gas	0	0	10.5
PETROL PRO.	1	0	6.9	PETROL PRO.	4	0	10.5
Ref.gas	0	0	0	Ref.gas	0	0	0
Lpg	0	0	0.5	Lpg	0	0	0
Res. fuel oil	1	0	3.7	Res. fuel oil	0	0	4.2
Gas/dieseloil	0	0	2.7	Gas/dieseloil	0	0	4.2
Motorspirit	0	0	0	Motorspirit	0	0	0
Jet fuel/kero	0	0	0	Jet fuel/kero	0	0	0
other	0	0	0	other	4	0	2.1
TOTAL	10.2	0	86.7	TOTAL	4	0.0	81.7
EMISSIONFACTORS:		SO2	1995	EMISSIONFACTORS:		NOx	1995
(TON/PJ)				(TON/PJ)			
Sector	Power	Convers.	Industry	Sector	Power	Convers.	Industry
Fuel	Plants			Fuel	Plants		
SOLIDS	0	0	0	SOLIDS	0	0	0
Hard Coal	0	0	519	Hard Coal	300	0	300
Brown coal	0	0	0	Brown coal	300	0	300
Der. solid	0	0	519	Der. solid	300	0	300
Der. gaseous	0	0	519	Der. gaseous	48	0	59
GAS	0	0	0	GAS	0	0	0
Natural gas	0	0	0	Natural gas	48	0	59
PETROL PRO.	0	0	0	PETROL PRO.	0	0	0
Ref.gas	0	0	0	Ref.gas	48	0	59
Lpg	0	0	0	Lpg	48	0	59
Res. fuel oil	937	0	703	Res. fuel oil	180	0	144
Gas/dieseloil	187	0	187	Gas/dieseloil	180	0	144
Motorspirit	0	0	0	Motorspirit	0	0	0
Jet fuel/kero	0	0	0	Jet fuel/kero	0	0	0
other		0	0	other	0	0	0

.. DATA ON FUEL USE AND EMISSIONFACTORS							
COUNTRY:	NETHERLANDS						
ENERGY-USE	YEAR:	1980		ENERGY-USE	YEAR:	1995.0	
(PJ)				(PJ)	ENERGY 2000 en detail + UNIPEDE 1987		
Sector	Power	Convers.	Industry	Sector	Power	Convers.	Industry
Fuel	Plants			Fuel	Plants		
SOLIDS	71.6	20.2	49.4	SOLIDS	368.5	0.0	58.6
Hard Coal	57	0	1.9	Hard Coal	217	0.0	29.3
Brown coal	0	0	0	Brown coal	0	0.0	0
Der. solid	0	0	38.2	Der. solid	0	0.0	29.3
Der. gaseous	14.6	20.2	9.3	Der. gaseous	17	10.1	1.7
GAS	234	13.1	293.6	GAS	334	16.7	326.6
Natural gas	234	13.1	293.6	Natural gas	334	6.6	318.2
PETROL PRO.	219.6	114.4	127.3	PETROL PRO.	12	154.9	83.7
Ref.gas	3.9	52.5	38.3	Ref.gas	0	71.1	6.7
Lpg	0	0.3	11.6	Lpg	0	0.4	0
Res. fuel oil	215.2	53.8	56.2	Res. fuel oil	8	72.8	58.6
Gas/dieseloil	0.5	0.1	18.9	Gas/dieseloil	0.0273	0.1	25.1
Motorspirit	0	0	0	Motorspirit	0	0.0	0
Jet fuel/kero	0	0	0.1	Jet fuel/kero	0	0.0	0
other	0	7.7	2.2	other	4	10.4	0
TOTAL	525.2	147.7	470.3	TOTAL	714.5	171.6	468.9
EMISSIONFACTORS:		SO2	1995	EMISSIONFACTORS:		NOx	1995
(TON/PJ)				(TON/PJ)			
Sector	Power	Convers.	Industry	Sector	Power	Convers.	Industry
Fuel	Plants			Fuel	Plants		
SOLIDS	0	0	0	SOLIDS	0	0	0
Hard Coal	780	519	650	Hard Coal	270	0	220
Brown coal	0	0	244	Brown coal	270	0	220
Der. solid	0	0	1169	Der. solid	270	0	220
Der. gaseous	1169	1169	1169	Der. gaseous	15	15	15
GAS	0	0	0	GAS	0	0	0
Natural gas	0	0	0	Natural gas	140	100	80
PETROL PRO.	0	0	0	PETROL PRO.	0	0	0
Ref.gas	0	95	0	Ref.gas	200	155	200
Lpg	0	95	0	Lpg	15	15	15
Res. fuel oil	702	1418	702	Res. fuel oil	180	210	160
Gas/dieseloil	211	211	211	Gas/dieseloil	250	60	60
Motorspirit	0	0	0	Motorspirit	0	0	0
Jet fuel/kero	0	0	0	Jet fuel/kero	0	0	0
other		0	0	other	0	0	0

DATA ON FUEL USE AND EMISSIONFACTORS							
COUNTRY:	PORTUGAL						
ENERGY-USE	YEAR:	1980		ENERGY-USE	YEAR:	1995	
(PJ)				(PJ)	ENERGY 2000 en detail + UNIPEDE 1987		
Sector	Power	Convers.	Industry	Sector	Power	Convers.	Industry
Fuel	Plants			Fuel	Plants		
SOLIDS	4.7	1.7	9.8	SOLIDS	113	0	62.8
Hard Coal	3.6	0	1.4	Hard Coal	140	0	8.9714286
Brown coal	0	0	0	Brown coal	0	0	0.0
Der. solid	0	0	7.7	Der. solid	0	0	49.3
Der. gaseous	1.1	1.7	0.7	Der. gaseous	0	0	4.5
AS	0	0	0	GAS	0		16.7
Natural gas	0	0	0	Natural gas	0	0	16.7
PETROL PRO.	59	14.1	90.8	PETROL PRO.	47		125.6
Ref.gas	0	0	0	Ref.gas	0	0	0.0
Lpg	0	0	4.7	Lpg	0	0	6.5
Res. fuel oil	56.6	13.8	79.9	Res. fuel oil	43	0	110.5
Gas/dieseloil	2.4	0.3	5.7	Gas/dieseloil	0	0	7.9
Motorspirit	0	0	0	Motorspirit	0	0	0.0
Jet fuel/kero	0	0	0.5	Jet fuel/kero	0	0	0.7
other	0	0	0	other	4	0	0.0
TOTAL	63.7	15.8	100.6	TOTAL	160	0.0	205.1
EMISSIONFACTORS:		SO2	1995	EMISSIONFACTORS:		NOx	1995
(TON/PJ)				(TON/PJ)			
Sector	Power	Convers.	Industry	Sector	Power	Convers.	Industry
Fuel	Plants			Fuel	Plants		
SOLIDS	0	0	0	SOLIDS	0	0	0
Hard Coal	778	778	778	Hard Coal	500	0	225
Brown coal	778	1257	1257	Brown coal	0	0	240
Der. solid	778	0	648	Der. solid	0	0	225
Der. gaseous	648	648	648	Der. gaseous	70	70	76
GAS	0	0	0	GAS	0	0	0
Natural gas	0	0	0	Natural gas	0	70	76
PETROL PRO.	0	0	0	PETROL PRO.	0	0	0
Ref.gas	0	42	0	Ref.gas	0	70	76
Lpg	0	0	0	Lpg	0	70	76
Res. fuel oil	1405	1273	1077	Res. fuel oil	316	205	298
Gas/dieseloil	468	468	468	Gas/dieseloil	316	60	60
Motorspirit	0	0	0	Motorspirit	0	0	0
Jet fuel/kero	0	0	0	Jet fuel/kero	0	0	0
other		0	0	other	0	0	0

DATA ON FUEL USE AND EMISSIONFACTORS							
COUNTRY:	SPAIN						
ENERGY-USE	YEAR:	1980		ENERGY-USE	YEAR:	1995	
(PJ)				(PJ)	ENERGY 2000 en detail + UNIPEDE 1987		
Sector	Power	Convers.	Industry	Sector	Power	Convers.	Industry
Fuel	Plants			Fuel	Plants		
SOLIDS	404.3	11.8	133.5	SOLIDS	626		293
Hard Coal	237.2	0.1	22.4	Hard Coal	519	0	49.2
Brown coal	160.1	0	0.6	Brown coal	107	0	1.3
Der. solid	0	0.2	66.7	Der. solid	0	0	146.4
Der. gaseous	7	11.5	43.8	Der. gaseous	0	0	96.1
GAS	11.2	2.4	26.9	GAS	0		154.9
Natural gas	11.2	2.4	26.9	Natural gas	0	0	154.9
PETROL PRO.	368.3	66.4	358.3	PETROL PRO.	84		552.7
Ref.gas	0	4.3	0.1	Ref.gas	0	0	0.2
Lpg	0	0.2	14.4	Lpg	0	0	22.2
Res. fuel oil	365.1	61.9	327.6	Res. fuel oil	84	0	505.3
Gas/dieseloil	3.2	0	16.2	Gas/dieseloil	0	0	25.0
Motorspirit	0	0	0	Motorspirit	0	0	0.0
Jet fuel/kero	0	0	0	Jet fuel/kero	0	0	0.0
other	0	0	0	other	0	0	0.0
TOTAL	783.8	80.6	518.7	TOTAL	710	0.0	1000.6
EMISSIONFACTORS:		SO2	1995	EMISSIONFACTORS:		NOx	1995
(TON/PJ)				(TON/PJ)			
Sector	Power	Convers.	Industry	Sector	Power	Convers.	Industry
Fuel	Plants			Fuel	Plants		
SOLIDS	0	0	0	SOLIDS	0	0.0	0
Hard Coal	910	910	910	Hard Coal	500	220.0	220
Brown coal	4539	4539	4539	Brown coal	500	200.0	240
Der. solid	0	0	1689	Der. solid	500	200.0	200
Der. gaseous	1689	1689	1689	Der. gaseous	45	0.0	0
GAS	0	0	0	GAS	0	0.0	0
Natural gas	0	0	0	Natural gas	175	90.0	90
PETROL PRO.	0	0	0	PETROL PRO.	0	0.0	0
Ref.gas	0	0	0	Ref.gas	200	120.0	200
Lpg	0	0	0	Lpg	0	0.0	0
Res. fuel oil	1687	1446	1446	Res. fuel oil	400	200.0	160
Gas/dieseloil	482	482	482	Gas/dieseloil	60	60.0	60
Motorspirit	0	0	0	Motorspirit	0	0.0	0
Jet fuel/kero	0	0	0	Jet fuel/kero	0	0.0	0
other		0	0	other	0	0.0	0

DATA ON FUEL USE AND EMISSIONFACTORS							
COUNTRY:	UNITED KINGDOM						
ENERGY-USE	YEAR:	1980		ENERGY-USE	YEAR:	1995	
(PJ)				(PJ)	ENERGY 2000 en detail + UNIPEDE 1987		
Sector	Power	Convers.	Industry	Sector	Power	Convers.	Industry
Fuel	Plants			Fuel	Plants		
SOLIDS	2108	58.7	298.3	SOLIDS	2383	16.7	330.8
Hard Coal	2094	17	144.3	Hard Coal	2345	16.7	276
Brown coal	0	0	0	Brown coal	21	0.0	0
Der. solid	5.6	0.4	102.7	Der. solid	0	0.0	55
Der. gaseous	8.7	41.3	51.3	Der. gaseous	17	38.8	56
GAS	23.2	59.3	565.6	GAS	17	108.9	674.1
Natural gas	23.2	59.3	565.6	Natural gas	17	70.1	618
PETROL PRO.	340.7	270.2	545.8	PETROL PRO.	84	255.4	447
Ref.gas	0	108	0.3	Ref.gas	0	102.1	0
Lpg	0	0.8	47.1	Lpg	0	0.8	46
Res. fuel oil	317.6	141	346.8	Res. fuel oil	84	133.3	234
Gas/dieseloil	23.1	0.8	151.6	Gas/dieseloil	0	0.8	167
Motorspirit	0	0	0	Motorspirit	0	0.0	0
Jet fuel/kero	0	0	0	Jet fuel/kero	0	0.0	0
other	0	19.6	0	other	0	18.5	0
TOTAL	2472	388.2	1409.7	TOTAL	2269	381.0	1451.9
EMISSIONFACTORS:		SO2	1995	EMISSIONFACTORS:		NOx	1995
(TON/PJ)				(TON/PJ)			
Sector	Power	Convers.	Industry	Sector	Power	Convers.	Industry
Fuel	Plants			Fuel	Plants		
SOLIDS	0	0	0	SOLIDS	0	0	0
Hard Coal	1114	1009	1009	Hard Coal	370	178	178
Brown coal	833	0	0	Brown coal	370	0	0
Der. solid	578	0	578	Der. solid	370	178	178
Der. gaseous	578	578	578	Der. gaseous	50	178	178
GAS	0	0	0	GAS	0	0	0
Natural gas	0	0	0	Natural gas	50	0	178
PETROL PRO.	0	0	0	PETROL PRO.	0	0	0
Ref.gas	0	0	0	Ref.gas	50	178	0
Lpg	0	0	0	Lpg	50	178	178
Res. fuel oil	952	952	952	Res. fuel oil	160	178	178
Gas/dieseloil	190	190	190	Gas/dieseloil	160	178	178
Motorspirit	0	0	0	Motorspirit	0	0	0
Jet fuel/kero	0	0	0	Jet fuel/kero	0	0	0
other		0	0	other	0	0	0

TECHNICAL DOCUMENT II:

INTERLINK: modifications and detailed results

CONTENTS Page

1. INTRODUCTION

This technical document describes, in a more detailed manner as in the main report, the:
- modifications made in the EC country models of OECD INTERLINK (section 2);
- detailed results of calculations with INTERLINK (section 3);
- input data on costs and investments to control SO_2 and NO_X emissions (section 4).

The results for SO_2 and NO_X as included in section 3 are, unless otherwise stated, the results in a so-called 'linked mode' assuming a fixed nominal interest rate. That is to say accomodating monetary policy.
Section 4 presents inputdata for SO_2 and NO_X at factor costs, in 1985 prices in national valuta as well as Deutschmark. Conversion of these data in marketprices of the OECD baseyear took place within INTERLINK. The summarized results of this conversion are included in the results for SO_2 and NO_X (section 3) in the following fashion:
- environmental investments are presented as % of the gross domestic product at constant prices of the OECD baseyear (generally 1983);
- annual costs (including capital cost: interest and depreciation) are also presented as % of the gross domestic product.

2. MODIFICATIONS OF INTERLINK

2.1. Introduction

To capture the various macroeconomic channels of impact of air pollution control measures i.e. of large combustion plants INTERLINK, the OECD's secretariat's model of the world economy, has been adapted. This in order to deal with the specific economic characteristics of the proposed pollution control measures. Generally two main channels of impact can be distinguished:

a. of the expenditures (and hence costs) on environmental (or pollution control) investments[1];
b. of the expenditures (and costs) of the exploitation of the environmental investments.

Section 2 describes the modifications caused by the creation of new variables and the related redefining of existing variables and defining of new equations. Section 3 describes the adaptations needed to add these new variables to relevant existing equations. In the fourth section a full overview of the adapted equations for one large and one small EC country is presented. A glossary of variables used is included in section 5.

2.2. Creation of new variables and related modifications

Set of new variables

The first step in the adjustment of INTERLINK involves the creation of a set of new variables. For both the large and small country models the following new variables are created:

IECF	environmental investment at factor lost, volume
IECV	environmental investment at market prices, volume
ENBECF	energy used by environmental capital at factor cost, volume
ENBEC	energy used by environmental capital at market prices, volume

---

[1]) In this technical document the term environmental investment is used as a synonym for pollution control investments.

ETEC	employment to exploit environmental capital
LAEC	expenditure on labour requirements to exploit environmental capital, volume
MAECF	material to exploit environmental capital at factor cost, volume
MAEC	material to exploit environmental capital at market prices, volume
EEV	environmental exploitation expenditure, volume
EEE	environmental exploitation expenditure, value

In addition only for large country models the following variables are created:

KECV	environmental capital stock
KBVEC	business capital stock
ENBVEC	energy used by business sector
ETBEC	business sector employment

Only for small country models the following additional variable is created:

CACO	capital costs

Redefinition of existing variables

The creation of new variables necessitates the following redefinition of existing INTERLINK variables.

IBV	business fixed investment less environmental investment. volume
KBV	business capital stock less environmental capital stock
ENBV	energy used by business sector less energy used by environmental capital
ETB	business sector employment, total less government and less employment to exploit environmental capital

The newly created variables can be distinguished in variables whose value is determined outside INTERLINK (data) and variables whose value is determined within INTERLINK (defined variables). The following newly created variables are data.

IECF	environmental investment at factor cost, volume
ENBECF	energy used by environmental capital at factor cost, volume
ETEC	employment to exploit environmental capital at factor cost, volume
MAECF	material to exploit environmental capital at factor cost, volume
CACO	capital costs

Definition of new variables in large country models

The other newly created variables are defined as follows. For large countries (based on Germany):

IECV = IECF * (PTDD/(PTDD - (IOTRIT * PIB)))

IECV	environmental investment at market prices, volume
IECF	environmental investment at factor cost, volume
PTDD	total domestic demand deflator
PIB	deflator for business fixed investment
IOTRIT	IO coefficient of indirect taxes in total investment

```
KECV = (IECV/2) + (KECV(-1) * (1-(RSCRB/200)))
```

KECV	environmental capital stock
IECV	environmental investment at market prices, volume
RSCRB	scrapping rate of business capital

```
KBVEC = KBV + KECV
```

KBVEC	business capital stock
KBV	business capital stock less environmental capital stock
KECV	environmental capital stock

```
ENBEC = ENBECF * (PTDD/(PTDD - (((IOTRCP + IOTRCG + IOTRIT)/3)
        * PENB)))
```

ENBEC	energy used by environmental capital at market prices, volume
ENBECF	energy used by environmental capital at factor cost, volume
PTDD	total domestic demand deflator
PENB	deflator for energy used by business sector
IOTRCP	IO coefficient of indirect taxes in private consumption
IOTRCG	IO coefficient of indirect taxes in government consumption
IOTRIT	IO coefficient of indirect taxes in total investment

```
ENBVEC = ENBV + ENBEC
```

ENBVEC	energy used by business sector
ENBV	energy used by business sector less energy used by environmental capital
ENBEC	energy used by environmental capital at market prices, volume

```
LAEC = ETEC * (WSSE/PCP) * (PTDD/(PTDD  - (((IOTRCP + IOTRCG +
       IOTRIT)/3)        * PCP)))
```

LAEC	expenditure on labor requirements to exploit environmental capital, volume
ETEC	employment to exploit environmental capital
WSSE	compensation per employee, private sector

PCP	deflator for private consumption
PTDD	total domestic demand deflator
IOTRCP	IO coefficient of indirect taxes in private consumption
IOTRCG	IO coefficient of indirect taxes in government consumption
IOTRIT	IO coefficient of indirect taxes in total investment

ETBEC = ETB + ETEC

ETBEC	business sector employment
ETB	business sector employment, total less government less employment to exploit environmental capital
ETEC	employment to exploit environmental capital

MAEC = MAECF * (PTDD/(PTDD - (((IOTRCP + IOTRCG + IOTRIT)/3) * PGDP)))

MAEC	material to exploit environmental capital at market prices, volume
MAECF	material to exploit environmental captial at factor cost, volume
PTDD	total domestic demand deflator
PGDP	deflator gross national/domestic product at market prices
IOTRCP	IO coefficient of indirect taxes in private consumption
IOTRCG	IO coefficient of indirect taxes in government consumption
IOTRIT	IO coefficient of indirect taxes in total investment

EEV = ENBEC + LAEC + MAEC

EEV	environmental exploitation expenditure, volume
ENBEC	energy used by environmental capital at market prices, volume
LAEC	expenditure on labor requirements to exploit environmental capital, volume
MAEC	material to exploit environmental capital at market prices, volume

EEE = ENBEC * PENB + LAEC * PCP + MAEC * PGDP

EEE	environmental exploitation expenditure, value
ENBEC	energy used by environmental capital at market prices, volume
LAEC	expenditure on labor requirements to exploit environmental capital, volume
MAEC	material to exploit environmental capital fat market prices, volume

PENB	deflator for energy used by business sector
PCP	deflator for private consumption
PGDP	deflator gross national/domestic product at market prices

Definition of new variables in small country models

For small countries (based on Belgium and Luxembourg):

```
IECV = IECF * (((1 + XTIND) * PTDD)/((1 + XTIND) * PTDD - XTIND
       * PITCG))
```

IECV	environmental investment at market prices, volume
IECF	environmental investment at factor cost, volume
XTIND	tax rate, indirect taxes
PTDD	total domestic demand deflator
PITCG	deflator for total investment and government non-wage consumption

```
ENBEC = ENBECF * (((1 + XTIND) * PTDD)/((1 + XTIND) * PTDD - XTIND
        * PDE))
```

ENBEC	energy used by environmental capital at market prices, volume
ENBECF	energy used by environmental capital at factor cost, volume
XTIND	tax rate, indirect taxes
PTDD	total domestic demand deflator
PDE	price of domestically produced and consumed energy, index

```
LAEC = ETEC * (WSSE/PCP) * (((1 + XTIND) * PTDD)/((1 + XTIND)
       * PTDD - XTIND + PCP))
```

LAEC	expenditure on labor requirements to exploit environmental captial, volume
ETEC	employment to exploit environmental capital
WSSE	compensation per employee, private sector
XTIND	tax rate, indirect taxes
PCP	deflator for private consumption
PTDD	total domestic demand deflator

```
MAEC = MAECF * (((1 + XTIND) * PTDD)/((1 + XTIND) * PTDD - XTIND
       * PGDP))
```

MAEC	material to exploit environmental capital at market prices, volume

MAECF	material to exploit environmental capital at factor cost, volume
XTIND	tax rate, indirect taxes
PTDD	total domestic demand deflator
PGDP	deflator gross national/domestic product at market prices

EEV = ENBEC + LAEC + MAEC

EEV	environmental exploitation expenditure, volume
ENBEC	energy used by environmental captial at market prices, volume
LAEC	expenditure on labor requirements to exploit environmental capital, volume
MAEC	material to exploit environmental capital at market prices, volume

EEE = ENBEC * PDE + LAEC * PCP + MAEC * PGDP

EEE	environmental exploitation expenditure, value
ENBEC	energy used by environmental captial at market prices, volume
LAEC	expenditure on labor requirements to exploit environmental capital, volume
MAEC	material to exploit environmental capital at market prices, volume
PDE	price of domestically produced and consumed energy, index
PCP	deflator for private consumption
PGDP	deflator gross national/domestic product at market prices

In summary, the first step in the adjustment of INTERLINK involves the creation of a set of new variables: data and definitions. The data are exogenous variables, whose value is determined outside INTERLINK. These data values are incorporated in the databanks of INTERLINK. The other newly created variables are endogenous variables, whose value is determined by the definition of new relationships. These new relationships are added to the already existing relationships of INTERLINK.

2.3. Adding new variables to existing relationships

The second step in the adjustment of INTERLINK involves adding the newly created variables to the relevant existing relationships of INTERLINK; this second step is not relevant for some data, which only figure in the new relationships.

Large country models

For large countries (based on Germany) the following equations are adjusted:

1. Private fixed investment (excl. stockbuilding), volume

```
IPV = IBV + IHV + IECV
```

2. Final domestic demand, volume

```
FDDV   = CPV + CGV + ITV + EEV
```

3. Change in stocks, volume

```
ISKV   = QBV - ENBV - ITV + MGSV - XGSV - STDSCV - CPV - CGV +
         (CGW/PCGW) - NITV - EEV + LAEC
```

4. Total fixed investment (excl. stockbuilding), value

```
IT = ((IBV + IECV ) * PIB) + ( IHV * PIH) + (IGV*PIG)
```

5. Intensity of factor utilization, index

```
IFU    = EXP (XIFUC0 + XIFU1 * LOG(CQB-1)) + XIFU2 + LOG((CPV + ITV
         + CGV - CGW/PCGW + XGSV - MGSV - NITV + ENBV + EEV - LAEC
         + STDSCV + .66 * (10**10) + .56 * ISKV(-1) - .24 *
         ISKV(-3))/QBSV) + XIFU3 * LOG((CPV(-1) + ITV(-1) + CGV(-1)
         - CGW(-1)/PCGW(-1) + XGSV(-1) - MGSV(-1) - NITV(-1) +
         ENBV(-1) + EEV(-1) - LAEC(-1) + STDSCV(-1) + .66*(10**10) +
         .56*ISKV(-2) - .24*ISKV(-4)/QBSV(-1) + XIFU4 +
         LOG(STOCKV(-1)/QBSV) + XIFU5 * LOG(QBSV) + XIFU9 * IRLRE +
         XIFU7*TIME + XIFU8/TIME)
```

6. Total employment

```
ET = ETBEC + EG
```

7. Productivity

```
PROD = GDPBV/ETBEC
```

8. Industrial production

```
INDPRO = INDPRO(-1) * ((CPV + (CGV - CGW/PCGW) + ITV + ISKV + EEV -
         LAEC + XGVB * XGSNAJ * XGBASE - MGVB * MGSNAJ * MGBASE)
         /(CPV(-1) + (CGV(-1) - CGW(-1)/PCGW(-1)) + ITV(-1)
         + ISKV(-1) + EEV(-1) - LAEC(-) + XGVB(-1) * XGSNAJ(-1)
         * XGBASE - MGVB(-1) * MGSNAJ(-1) * MGBASE))
```

9. Inverse profitability variable (business)

```
CQB =    ((PENB * ENBVEC) + ((PIB * (XRSCRB + .70 * IRL +
         XRED)/100) * (KBVEC + KBVEC(-1))/2 + (WSSE * ETBEC) + PGDP
         * MAEC)/(QBV*PQB)
```

10. Average normal costs

```
COST =   (WSSE * ETBEC + UCC * 0.5 * (KBVEC + KBVEC(-1)) +(PENB *
         ENBVEC + PGDP * MAEC)/QBSV
```

11. Normal longrun costs, growth rate

```
CNORMG = XCOST1 * ((CLNORM/CLNORM(-1) - 1.0) + (CLNORM(-1)/
         (CLNORM(-2) - 1.0) + (CLNORM(-2)/CLNORM(-3) - 1.0)
         + (CLNORM(-3)/CLNORM(-4) - 1.0))/4.0 + XCOST2 *(((PENB/
         PENB(-1)) * ((ENBVEC/QBV)/(ENBVEC(-1)/QBV(-1))) - 1)
         + ((PENB(-1)/PENB(-2)) * ((ENBVEC(-1)/QBV(-1))/
         (ENBVEC(-2)/QBV(-2))) -1))/2.0 + (1 - XCOST1 - XCOST2)
         * ((CCNORM/CCNORM(-1)) * (((IBV + IECV)/QBV)/((IBV(-1)
         + IECV(-1))/QBV(-1))) - 1.0)
```

12. Actual costs (weighted), growth rate

```
COSTG =  XCOST1 * ((WSSE/WSSE(-1)) * ((ETBEC/QBV)/(ETBEC(-1)/
         QBV(-1))) - 1.0) + XCOST2 * ((PENB/PENB(-1)) * ((ENBVEC/
         QBV)/(ENBVEC(-1)/QBV(-1))) - 1.0) + (1.0 - XCOST1 - XCOST2)
         *((UCC/UCC(-1)) * (((IBV + IECV)/QBV)/((IBV(-1) + IECV(-1))
         /QBV(-1))) - 1.0)
```

13. Indirect taxes

```
TIND   = XITIM * (IOTRCP * CP + IOTRCG * CG + IOTRIT * IT
         + IOTRXM * XGS + NIT + ((IOTRPC + IOTRCG + IOTRIT)/3)*EEE)
```

14. Subsidies

```
TSUB =   (XITIM -1) * (IOTRCP * CP + IOTRCG * CG + IOTRIT * IT +
         IOTRXM * XGS + NIT + ((IOTRCP + IOTRCG + IOTRIT)/3) * EEE)
```

15. Deflator, final domestic demand

```
PFDD =   (CPV * PCP + IT + CG + EEE)/(CPV + ITV + CGV + EEV)
```

16. Weighted demand for imports of energy

```
WEXME =  (IOMECP * CPV + IOMEIT * (ITV + ISKV) + IOMECG * (CGV -
         CGW/PCGW) + IOMEXT * XGSV + ((IOMECP + IOMEIT + IOMECG)/3)
         * (EEV - LAEC))/IOMEFE
```

Small country models

For small countries models (based on Belgium and Luxembourg) the following equations are adjusted:

1. Private fixed investments (excl. stockbuiliding), volume

```
IPV =    IBV + IHV + IECV
```

2. Fianla domestic product at factor cost less government wager, volume

```
FDDV =   CPV + CGV + IIV + EEV
```

3. Gross domestic product at factor cost less government wages, volume

```
GDPBV =  CPV + (CGNW/PITCG) + ITV + ISKV + EEV + XGSV - MGSV
```

4. Dependent employement private sector

For computer - technical reasons this equation is split up by creating the new variabele XXX.

```
XXX =    XEERW * (LEERWO * ((WSSE/PGDP)/(WSSE(-1)/PGDP(-1))-1.0)
         + LEERW1 * ((WSSE(-1)/PGDP(-1))/(WSSE(-2)/PGDP(-2))-1.0)
         + LEERW2 * ((WSSE(-2)/PGDP(-2))/(WSSE(-3)/PGDP(-3))-1.0)
         + LEERW3 * ((WSSE(-3)/PGDP(-3))/(WSSE(-4)/PGDP(-4))-1.0))
EEP =    ETEC + EEP(-1) * (1-XEETR + XEEY * (LEEY0 * ((GDPV-LAEC)/
         (GDPV(-1)-LAEC(-1)) -1.0) + LEEY1 * ((GDPV(-1)-LAEC(-1))/
         (GDPV(-2)-LEAC(-2)) -1.0) + LEEY2 * ((GDPV(-2)-LAEC(-2))/
         (GDPV(-3)-LAEC(-3)) -1.0) + LEEY3 * ((GDPV(-3)-LAEC(-3))/
         (GDPV(-4)-LAEC(-4)) -1.0)) + XXX)
```

5. Industrial production

```
INDPRO = INDPRO (-1) * ((CPV + (CGNW/PITCG) + ITV + ISKV + EEV-LAEC
         + XGVB * XGSNAJ * XGBASE - MGVB * MGSNAJ * MGBASE)/(CPV(-1)
         + (CGNW(-1)/PITCG(-1)) + ITV(-1) + ISKV(-1) + EEV(-1) -
         LAEC(-1) + XGVB(-1) * XGSNAJ(-1) * XGBASE - MGVB(-1) *
         MGSNAJ(-1) * MGBASE))
```

6. Net indirect taxes and property income government

```
TINDYG = TINDYG(-1) + (XTIND * (1/(1 + XTIND))) * ((PCP * CPV
         + PITCG * ITV + CGNW + EEE) - PCP(-1) * CPV(-1) + PITCG(-1)
         * ITV(-1) + CGNW(-1) + EEE(-1)) + NIT-NIT(-1)
```

7. Deflator for private consumption

For computer-technical reasons this equation is split up by creating the new variable YYY.

```
YYY =    ENSHD*((MEV(-1)*(PMED(-1)/EXCHIN(-1)))/(PTDD(-1)*
         TDDV(-1)-(GW(-1)+XMV(-1)*PXM(-1)*MGVBAJ(-1)*MGVNAJ(-1)))
         *(XPPEO*((PMED/EXCHIN)/PMED(-1)/EXCHIN(-1))-1)+XPPE1*
         ((PMED(-1)/EXCHIN(-1))/(PMED(-2)/EXCHIN(-2))-1))+(XPPMO*
         (PMNE/PMNE(-1)-1.0)+XPPM1*(PMNE(-1)/PMNE(-2)-1.0)+XPPM2
         *(PMNE(-2)/PMNE(-3)-1.0))+(1/ENSHA)*((MEVC(-1)*PDE(-1))
         /(PTDD(-1)*TDDV(-1)-CGW(-1)+XMV(-1)*PXM(-1)*MGVBAJ(-1)
         *MGVNAJ(-1)))*(XPPEO*(PDE/PDE(-1)-1.0)+XPPE1*
         (PDE(-1)/PDE(-2)-1.0))
PCP =    PCP(-1)+PCP(-1)*((XPCCN)+XPCGP*.01*GAP+XPCWS*
         (LPCWO*(WSSE/WSSE(-1)-1.0)+LPCW1*(WSSE(-1)/WSSE(-2)
         -1.0)+LPCW2*(WSSE(-2)/WSSE(-3)-1.0)+LPCW3*(WSSE(-3)/
         WSSE(-4)-1.0)+LPCW4*(WSSE(-4)/WSSE(-5)-1.0)+LPCW5*
         (WSSE(-5))WSSE(-6)-1.0))+XPCPR*(LPCPRO*(PROD/PROD(-1)
         -1.0)+LPCPR1*(PROD(-1)/PROD(-2)-1.0)+LPCPR2*(PROD(-2)/
         PROD(-3)-1.0)+LPCPR3*(PROD(-3)/PROD(-4)-1.0)+LPCPR4*
         (PROD(-4)/PROD(-5)-1.0)+LPCPR5*(PROD(-5)/PROD(-6)-1.0))
         +YYY)+(EEE+CACO*PITCGJ/GDP-((EEE(-1)+CACO(-1)*
         PITCG(-1))/GDP(-1))
```

8. Total domestic demand deflator

```
PTDD =   (PCP * CPV + PITCG * (ITV + ISKV + CGV) + EEE)/(CPV + ITV +
         ISKV + CGV + EEV)
```

9. Weighted demand for imports of energy

```
WEXME =  (IOMECP * CPV + IOMEIT * (ITV + ISKV) + IOMECG * (CGV -
         CGW/PCGW) + IOMEXT * XGSV + ((IOMECP + IOMEIT + IOMECG)/3)
         * (EEV - LAEC))/IOMEFE
```

2.4. Overview of modified equations

GERMANY

```
5800    DEFINE GER
5700    IECV=IECF*(PTDD/(PTDD-(IOTRIT*PIB)))
5800    KECV=(IECV/2)+(KECV(-1)*(1-(RSCRB/200)))
5900    KBVEC=KBV+KECV
6000    ENBEC=(PTDD/(PTDD-(((IOTRCP+IOTRCG+ICTRIT)/3)* &
6050    PENB)))*ENBECF
6100    ENBVEC=ENBV+ENBEC
6200    LAEC=(PTDD/(PTDD-(((IOTRCP+ICTRCG+IOTRIT)/3)* &
6250    PCP)))*ETEC*(WSSE/PCP)
6300    ETBEC=ETB+ETEC
6400    MAEC=(PTDD/(PTDD-(((IOTRCP+ICTRCG &
6450    +ICTRIT)/3)*PGDP)))*MAECF
6500    EEV=ENBEC+LAEC+MAEC
6600    EEE=ENBEC*PENB+LAEC*PCP+MAEC*PGDP
6700    IPV=IBV+IHV+IECV
6800    FDDV=CPV+CGV+ITV+EEV
6900    ISKV=QBV-ENBV-ITV+MGSV-XGSV &
7000    -STDSCV-CPV-CGV+(CGW/PCGW)+NITV &
7100    -EEV+LAEC
7200    IT=((IBV+IECV)*PIB)+(IHV*PIH)+(IGV*PIG)
7300    IFU=EXP(XIFUC0+XIFU1*LOG(Q3B(-1)) &
7400    +XIFU2*LOG((CPV+ITV+CGV-CGW/PCGW &
7500    +XGSV-MGSV-NITV+ENBV+EEV-LAEC &
7600    +STDSCV+.66*(10**10)+.56*ISKV(-1) &
7700    -.24*ISKV(-3))/QBSV)+XIFU3*LOG((CPV(-1) &
7750    +ITV(-1)+CGV(-1)-CGW(-1)/PCGW(-1) &
7800    +XGSV(-1)-MGSV(-1)-NITV(-1)+ENBV(-1)+EEV(-1) &
7900    -LAEC(-1)+STDSCV(-1)+.56*(10**10)+.56*ISKV(-2) &
8000    -.24*ISKV(-4))/QBSV(-1))+XIFL4* &
8100    LOG(STOCKV(-1)/QBSV)+XIFU5*LOG(QBSV) &
8150    +XIFU9*IRLRE+XIFU7*TIME+XIFU8/TIME)
8200    ET=ETBEC+EG
8300    PROD=GDPBV/ETBEC
8400    INDPRO=INDPRO(-1)*(((CPV+(CGV-CGW/PCGW) &
8500    +ITV+ISKV+EEV-LAEC &
8600    +XGVB*XGSNAJ*XGBASE-MGVB*MGSNAJ*MGBASE) &
8700    /(CPV(-1)+(CGV(-1)-CGW(-1)/PCGW(-1))+ITV(-1) &
8800    +ISKV(-1)+EEV(-1)-LAEC(-1) &
8900    +XGVB(-1)*XGSNAJ(-1)*XGBASE &
8950    -MGVB(-1)*MGSNAJ(-1)*MGBASE))
9000    CQB=((PENB*ENBVEC) &
9100    +((PIB*(XRSCRB+0.7*IRL+XRED)/100)* &
9200    (KBVEC+KBVEC(-1))/2) &
9300    +(WSSE*ETBEC)+PGDP*MAEC)/(QBV*PQB)
9400    COST=(WSSE*ETBEC+UCC*0.5*(KBVEC+KBVEC(-1)) &
9500    +PENB*ENBVEC+PGDP*MAEC)/QBSV
9501    CNORMG=XCOST1*(((CLNORM/CLNORM(-1)-1.0)+(CLNORM(-1)/ &
9502    CLNORM(-2)-1.0)+((CLNORM(-2)/CLNORM(-3)-1.0) &
9503    +(CLNORM(-3)/CLNORM(-4)-1.0))/4.0+XCOST2*(((PENB/ &
9504    PENB(-1))*((ENBVEC/QBV)/(ENBVEC(-1)/QBV(-1)))-1.) &
9505    +((PENB(-1)/PENB(-2))*((ENBVEC(-1)/QBV(-1))/ &
9506    (ENBVEC(-2)/QBV(-2)))-1.))/2.0+(1.-XCOST1-XCOST2)* &
9507    (((CCNORM/CCNORM(-1))*(((IBV+IECV)/QBV)/((IBV(-1)+ &
9508    IECV(-1))/QBV(-1)))-1.0)
9509    COSTG=XCOST1*((WSSE/WSSE(-1))*((ETBEC/QBV)/(ETBEC(-1)/ &
9510    QBV(-1)))-1.0)+XCOST2*((PENB/PENB(-1))*((ENBVEC/QBV)/ &
9511    (ENBVEC(-1)/QBV(-1)))-1.0)+(1.0-XCOST1-XCOST2)* &
9512    (((UCC/UCC(-1))*(((IBV+IECV)/QBV)/((IBV(-1)+IECV(-1))/ &
9513    QBV(-1)))-1.0)
9600    TIND=XITIM*(IOTRCP*CP+IOTRCG*CG+ICTRIT*IT &
9700    +ICTRXM*XGS+NIT+((IOTRCP+IOTRCG+ICTRIT)/3)* &
9800    EEE)
9900    TSUB=(XITIM-1.)*(IOTRCP*CP+ICTRCG*CG+IOTRIT*IT &
10000   +IOTRXM*XGS+NIT+((IOTRCP+IOTRCG+ICTRIT)/3)* &
10100   EEE)
10200   PFDD=(CPV*PCP+IT+CG+EEE)/ &
10300   (CPV+ITV+CGV+EEV)
10400   WEXME=(ICMECP*CPV+IOMEIT*(ITV+ISKV) &
10500   +ICMECG*(CGV-CGW/PCGW)+IOMEXT*XGSV+((ICMECP+ &
10600   IOMEIT+IOMECG)/3)*(EEV-LAEC))/IOMEPF
12700
```

```
      BELGIUM
4400  DEFINE BLX
4500  IECV=(((1.+XTIND)*PTDD)/((1.+XTIND)*PTDD &
4550  -XTIND*PITCG))*IECF
4600  ENBEC=(((1.+XTIND)*PTDD)/((1.+XTIND)*PTDD &
4650  -XTIND*PDE))*ENBECF
4700  LAEC=(((1.+XTIND)*PTDD)/((1.+XTIND)*PTDD &
4750  -XTIND*PCP))*(WSSE/PCP)*ETEC
4800  MAEC=(((1.+XTIND)*PTDD)/((1.+XTIND)*PTDD &
4850  -XTIND*PGDP))*MAECF
4900  EEV=ENBEC+LAEC+MAEC
5000  EEE=ENBEC*PDE+LAEC*PCP+MAEC*PGDP
5100  IPV=IBV+IHV+IECV
5200  FDDV=CPV+CGV+ITV+EEV
5300  GDPBV=CPV+(CGNW/PITCG)+ITV+ISKV &
5400  +EEV+XGSV-MGSV
5410  XXX=XEERW*(LEERWC*((WSSE/PGDP)/(WSSE(-1)/PGDP(-1)) &
5420  -1.0)+LEERW1*((WSSE(-1)/PGDP(-1))/ &
5430  (WSSE(-2)/PGDP(-2))-1.0)+LEERW2*((WSSE(-2)/ &
5440  PGDP(-2))/(WSSE(-3)/PGDP(-3))-1.0)+LEERW3* &
5450   ((WSSE(-3)/PGDP(-3))/(WSSE(-4)/PGDP(-4))-1.0))
5500  EEP=ETEC+EEP(-1)*(1.-XEETR+XEEY* &
5600  (LEEY0*((GDPV-LAEC)/(GDPV(-1)-LAEC(-1))-1.0) &
5700  +LEEY1*((GDPV(-1)-LAEC(-1))/(GDPV(-2) &
5750  -LAEC(-2))-1.0)+LEEY2*((GDPV(-2)-LAEC(-2))/ &
5800  (GDPV(-3)-LAEC(-3))-1.0)+LEEY3* &
5830  ((GDPV(-3)-LAEC(-3))/ &
5850   (GDPV(-4)-LAEC(-4))-1.0))+XXX)
6400  INDPRO=INDPRO(-1)*((CPV+(CGNW/PITCG)+ITV+ISKV &
6500  +EEV-LAEC+XGVB*XGSNAJ*XGBASE-MGVB* &
6600  MGSNAJ*MGBASE)/(CPV(-1)+(CGNW(-1)/PITCG(-1)) &
6650  +ITV(-1)+ISKV(-1) &
6700  +EEV(-1)-LAEC(-1)+XGVB(-1)*XGSNAJ(-1)*XGBASE &
6800  -MGVB(-1)*MGSNAJ(-1)*MGBASE))
6900  TINDYG=TINDYG(-1)+(XTIND*(1./(1.+XTIND)))* &
7000  ((PCP*CPV+PITCG*ITV+CGNW+EEE)-(PCP(-1)*CPV(-1) &
7100  +PITCG(-1)*ITV(-1)+CGNW(-1)+EEE(-1)))+NIT-NIT(-1)
7105  YYY=ENSHD*((MEV(-1)*(PMED(-1)/EXCHIN(-1)))/ &
7110  (PTDD(-1)*TDDV(-1)-CGW(-1)+XMV(-1)*PXM(-1)* &
7115  MGVBAJ(-1)*MGVNAJ(-1)))*(XPPEC*((PMED/ &
7120  EXCHIN)/(PMED(-1)/EXCHIN(-1))-1.)+XPPE1* &
7125  ((PMED(-1)/EXCHIN(-1))/(PMED(-2)/EXCHIN(-2)) &
7130  -1.))+(XPPMC*(PMNE/PMNE(-1)-1.0)+XPPM1* &
7135  (PMNE(-1)/PMNE(-2)-1.0)+XPPM2*(PMNE(-2)/ &
7140  PMNE(-3)-1.0))+(1./ENSHA)*((MEV(-1)*PDE(-1)) &
7145  /(PTDD(-1)*TDDV(-1)-CGW(-1)+XMV(-1)*PXM(-1) &
7150  *MGVBAJ(-1)*MGVNAJ(-1)))*(XPPEC*(PDE/PDE(-1) &
7155  -1.0)+XPPE1*(PDE(-1)/PDE(-2)-1.0))
7200  PCP=PCP(-1)+PCP(-1)*((XPCCM)+XPCGP*.C1*GAP &
7300  +XPCWS*(LPCWC*(WSSE/WSSE(-1)-1.0) &
7350  +LPCW1*(WSSE(-1)/WSSE(-2)-1.C) &
7400  +LPCW2*(WSSE(-2)/WSSE(-3)-1.C)+LPCW3* &
7500  (WSSE(-3)/WSSE(-4)-1.0)+LPCW4*(WSSE(-4)/ &
7550  WSSE(-5)-1.0)+LPCW5*(WSSE(-5)/WSSE(-6)-1.0)) &
7600  +XPCPR*(LPCPRC*(PROD/PROD(-1)-1.C)+LPCPR1* &
7650  (PROD(-1)/PROD(-2)-1.0)+LPCPR2*(PROD(-2)/ &
7700  PROD(-3)-1.0)+LPCPR3*(PROD(-3)/PROD(-4)-1.0) &
7900  +LPCPR4*(PROD(-4)/PROD(-5)-1.0)+LPCPR5* &
8200  (PROD(-5)/PROD(-6)-1.0))+YYY)+(EEE+CACO*PITCG)/GDP &
8300  -((EEE(-1)+CACO(-1)*PITCG(-1))/GDP(-1))
9000  PTDD=(PCP*CPV+PITCG*(ITV+ISKV+CGV)+EEE)/ &
9100  (CPV+ITV+ISKV+CGV+EEV)
9200  WEXME=(ICMECP*CPV+IOMEIT*(ITV+ISKV)+IOMECG* &
9300  (CGV-CGW/PCGW)+ICMEXT*XGSV+((IOMECP+IOMEIT &
9400  +IOMECG)/3)*(EEV-LAEC))/ICMEFE
```

2.5. Glossary of variables

CACO	capital costs
CCNORM	normal longrun unit cost of capital
CG	government consumption
CGNW	government consumption, excl. wages
CGV	government consumption, volume
CGW	government consumption, wages
CLNORM	normal longrun unit labor cost
CNORMG	normal longrun costs, growth rate
COST	average normal costs
COSTG	actual costs (weighted), growth rate
CP	private consumption
CPV	private consumption, volume
CQB	inverse profitability variable (business)
EEE	environmental exploitation expenditure, value
EEP	dependent employment, private sector
EEV	environmental exploitation expenditure, volume
EG	general government employment
ENBEC	energy used by environmental capital at market prices, volume
ENBECF	energy used by environmental capital at factor cost, volume
ENBV	energy used by business sector less energy used by environmental capital
ENBVEC	energy used by business sector
ENSHA	ratio, energy imports to domestic energy not re-exported
ENSHD	proportion of energy imports not re-exported
ET	total employment
ETB	business sector employment, total less government less employment to exploit environmental capital
ETBEC	business sector employment
ETEC	employment to exploit environmental capital
EXCHIN	exchange rate, index
FDDV	final domestic demand, volume
GAP	actual output over potential
GDP	gross national/domestic product
GDPBV	gross domestic product at factor cost less government wages, volume
GDPV	gross national/domestic product, volume
IBV	business fixed investment less environmental investment, volume
IECF	environmental investment at factor cost, volume
IECV	environmental investment at market prices, volume
IFU	intensity of factor utilisation, index
IGV	government investment, volume
IHV	investment in housing, volume
INDPRO	industrial production
IOMECG	IO coefficient imports of energy in non wage government consumption

IOMECP IO coefficient imports of energy in private consumption
IOMEFE IO coefficient of import prices (energy) for final expenditure
IOMEIT IO coefficient imports of energy in total investment
IOMEXT IO coefficient of import prices (energy) for exports (G & S)
IOTRCG IO coefficient of indirect taxes in government consumption
IOTRCP IO coefficient of indirect taxes in private consumption
IOTRIT IO coefficient of indirect taxes in total investment
IOTRXM IO coefficient of indirect taxes in exports of manufactures
IPV private fixed investment (excl. stockbuilding), volume
IRL interest rate, long-term
IRLRE interest rate, long-term, real
ISKV change in stocks, volume
IT total fixed investment (excl. stockbuilding), value
ITV total fixed investment (excl. stockbuilding), volume
KBV business captial stock less environmental capital stock
KBVEC business capital stock
KECV environmental capital stock
LAEC expenditure on labor requirements to exploit environmental capital, volume
LEERW0 real wage/employment response lag 0
LEERW1 real wage/employment response lag 1
LEERW2 real wage/employment response lag 2
LEERW3 real wage/employment response lag 3
LEEY0 output employment response lag 0
LEEY1 output employment response lag 1
LEEY2 output employment response lag 2
LEEY3 output employment response lag 3
LPCPR0 lag distribution for XPCPR lag 0
LPCPR1 lag distribution for XPCPR lag 1
LPCPR2 lag distribution for XPCPR lag 2
LPCPR3 lag distribution for XPCPR lag 3
LPCPR4 lag distribution for XPCPR lag 4
LPCPR5 lag distribution for XPCPR lag 5
LPCW0 lag distribution for XPCWS lag 0
LPCW1 lag distribution for XPCWS lag 1
LPCW2 lag distribution for XPCWS lag 2
LPCW3 lag distribution for XPCWS lag 3
LPCW4 lag distribution for XPCWS lag 4
LPCW5 lag distribution for XPCWS lag 5
MAEC material to exploit environmental capital at market prices, volume
MAECF material to exploit environmental capital at factor cost, volume
MEV imports of energy, volume
MGBASE ratio of national price base to forecast round price F
MGSNAJ goods & services imports national accounts adjustment factor
MGSV imports of goods and services, volume, N.A. basis

MGVB	imports of goods, volume, B.o.P. basis
MGVBAJ	imports of goods, $, adjustment to B.o.P. basis
MGVNAJ	imports of goods, $, adjustment to N.A. basis
NIT	lumpsum value: net indirect taxes
NITV	net indirect taxes, volume
PCGW	deflator for government consumption, wages
PCP	deflator for private consumption
PDE	price of domestically produced and consumed energy, index
PENB	deflator for energy used by business sector
PFDD	deflator, final domestic demand
PGDP	deflator gross national/domestic product at market prices
PIB	deflator for business fixed investment
PIG	deflator for public investment
PIH	deflator for housing investment
PITCG	deflator for total investment & government non-wage consumption
PMED	import unit value, $, energy
PMNE	price of non-energy imports
PQB	business gross output deflator
PROD	productivity
PTDD	total domestic demand deflator
PXM	export unit value, local currency, manufactures
QBSV	potential business gross output, volume
QBV	business gross output, volume
RSCRB	scrapping rate of business capital
STDSCV	statistical discrepancy, volume
STOCKV	total stock, volume
TDDV	total domestic demand, volume
TIME	time trend 1960I = 1.0
TIND	indirect taxes
TINDYG	net indirect taxes and property income government
TSUB	subsidies
UCC	user cost of capital
WEXME	weighted demand for imports of energy
WSSE	compensation per employee, private sector
XCOST1	labor cost coefficient, CNORMG and COSTG equation
XCOST2	energy cost coefficient, CNORMG and COSTG equation
XEERW	long run real wage elasticity for private sector employment
XEETR	private sector employment trend
XEEY	long run elasticity for private sector employment
XGBASE	ratio of national price base to forecast round price F
XGS	exports of goods and services, N.A. basis
XGSNAJ	goods & services exports national accounts adjustment factor
XGSV	exports of goods and services, volume, N.A. basis
XGVB	exports of goods, volume, B.o.P. basis
XIFU1	coefficient for CQB in IFU equation
XIFU2	coefficient for other independent variables in IFU equation

XIFU3	coefficient for other explanatory variables, lag 1, in IFU equation
XIFU4	coefficient for STOCKV(-1)/QBSV in IFU equation
XIFU5	coefficient for QBSV in IFU equation
XIFU7	coefficient for TIME in IFU equation
XIFU8	coefficient for 1/TIME in IFU equation
XIFU9	coefficient for IRLRE in IFU equation
XOFUCO	constant in IFU equation
XITIM	distribution between indirect taxes and subsidies
XMV	exports of manufacturers, volume
XPCCN	constant in PCP equation
XPCGP	coefficient for GAP in PCP equation
XPCPR	elasticity of productivity in PCP equation
XPCWS	elasticity of compensation in PCP equation
XPPE0	energy import price in consumer price equation, lag 0
XPPE1	energy import price in consumer price equation, lag 1
XPPM0	import price elasticity in consumer price equation, lag 0
XPPM1	import price elasticity in consumer price equation, lag 1
XPPM2	import price elasticity in consumer price equation, lag 2
XRED	impact other factors in user cost of capital
XRSCRB	impact scrapping rate of capital (business) in user cost of capital.
XTIND	tax rate, indirect taxes
XXX	part of EEP equation, created for computer-technical reasons
YYY	part of PCP equation, created for computer-technical reasons

3. RESULTS WITH INTERLINK

3.1. Introduction

This section presents the detailed result of the simulations with INTERLINK on a country by country base. It should be noted that a transformation in the time scale was introduced. In reality environmental investments are expected to take place in the period 1988-1993. Economic impacts however, need to be calculated untill 1997. In order to capture the final impact of the environmental costs, hence a time scale of 1988-1997 is needed. However, no data or solved model baseline covering the period 1988-1998 was available in INTERLINK. Only the period 1983-1992 could be included in the simulations. For the simulations it was therefore assumed that:

- environmental investments take place from 1983-1988
- the macroeconomic impact is also calculated for 1989-1992
- total period of calculating impacts 1983-1992[1])

First the results for SO_2 are presented (section 3.2) and next to that the results for NO_X (for a limited number of countries).

For SO_2 results are presented in this order:

Large country models: Germany
Italy
United Kingdom

Small models : Belgium (Luxembourg)
Denmark
Greece
Ireland
The Netherlands
Spain

Results for France and Portugal are not included since these countries have no abatement costs[2]).

[1]) From the simulation results over the period 1983-1992 it is possible to draw conclusions for the period 1987-1996 since the overall macroeconomic situation is not expected to be too divergent in both periods. Moreover, results of the simulations are not too sensitive to small changes in baseline (reference) projections.

[2]) For a restricted number of variables, available results are included in the main report.

For NO_x only the results are included (section 3.3) for:
Large country models: Germany
Italy
Small country models: Portugal
Ireland
The remaining countries either have no abatement (pollution control) costs at all (France, Greece) or very marginal costs. Results show a very minor impact. Reference is made to the main report for the summary of these results.
Finally section 3.4 summarises the results of isolated action versus coordinated action. Isolated action refers to the results with INTERLINK if one country solitarily controls its emissions. All results are obtained in a 'linked mode' that is to say including all world trade and financial linkages between countries in the OECD model.
Moreover the results of coordinated action, assuming non accomodating monetary policy, are presented. In this section results for all EC countries are included although in a less detailed fashion as section 3.2. The section includes figures for SO_2, NO_x and the simultaneous impact (SO_2 + NO_x).

SHORTAGE TABLE:

GERMANY — DIFFERENCES FROM BASELINE:WSP(3)-WSP(1)

VARIABLE	82	83	84	85	86	87	88	89	90	91	92
PRIVATE CONSUMPTION	0.00	0.01	0.03	0.02	-0.03	-0.05	-0.05	-0.05	-0.07	-0.07	-0.05
GOVT CONSUMPTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FIXED INVESTMENT:TOTAL	0.00	0.66	0.85	0.94	0.79	0.58	0.42	-0.19	-0.29	-0.25	-0.10
GOVERNMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL PRIVATE	0.00	0.76	0.97	1.07	0.90	0.66	0.49	-0.22	-0.33	-0.29	-0.11
RESIDENTIAL	0.00	0.13	0.25	0.35	0.27	0.10	-0.02	-0.16	-0.27	-0.32	-0.29
BUSINESS	0.00	0.27	0.54	0.62	0.43	0.17	-0.01	-0.25	-0.35	-0.28	-0.05
STOCKBUILDING(1)	0.00	0.01	0.07	0.07	0.01	-0.04	-0.05	-0.04	-0.07	-0.04	0.02
TOTAL DOMESTIC DEMAND	0.00	0.17	0.30	0.31	0.20	0.09	0.07	-0.05	-0.11	-0.08	0.02
REAL FOREIGN BALANCE(1)	0.00	-0.02	-0.05	-0.07	-0.07	-0.05	-0.05	-0.02	0.00	0.01	-0.01
EXPORTS(G & S)	0.00	0.07	0.08	0.06	-0.02	-0.08	-0.09	-0.13	-0.14	-0.10	-0.06
IMPORTS(G & S)	0.00	0.15	0.27	0.29	0.19	0.09	0.06	-0.07	-0.15	-0.13	-0.03
GDP/GNP(REAL)	0.00	0.14	0.23	0.23	0.13	0.04	0.03	-0.07	-0.11	-0.07	0.01
INDUSTRIAL PRODUCTION	0.00	0.17	0.27	0.27	0.15	0.05	0.04	-0.07	-0.12	-0.08	0.02
TOTAL EMPLOYMENT	0.00	0.05	0.13	0.19	0.19	0.13	0.06	-0.02	-0.11	-0.16	-0.15
UNEMPLOYMENT RATE(2)	0.00	-0.04	-0.11	-0.16	-0.16	-0.11	-0.06	0.02	0.09	0.13	0.13
DEFLATORS:											
PRIVATE CONSUMPTION	0.00	0.13	0.27	0.40	0.45	0.42	0.39	0.29	0.23	0.20	0.22
TOTAL DOM. DEMAND	0.00	0.15	0.31	0.45	0.50	0.46	0.42	0.31	0.25	0.22	0.24
EXPORTS	0.00	0.06	0.17	0.23	0.34	0.35	0.34	0.30	0.26	0.22	0.22
IMPORTS	0.00	0.05	0.12	0.20	0.27	0.31	0.33	0.31	0.29	0.26	0.24
GDP/GNP	0.00	0.15	0.32	0.47	0.51	0.47	0.42	0.31	0.24	0.21	0.23
WAGE RATE	0.01	0.17	0.34	0.44	0.43	0.37	0.36	0.29	0.24	0.25	0.30
COMPENSATION/EMPLOYEE	0.00	0.15	0.31	0.40	0.39	0.34	0.34	0.27	0.24	0.25	0.30

(1)% OF BASELINE GDPV

(2)CHANGE IN % RATE

.. INDICATES NOT APPLICABLE

ENVIRONMENTAL INVESTMENTS AS % OF GDP (3)	0.10	0.09	0.09	0.09	0.09	0.09	0.00	0.00	0.00	0.00
ENVIRONMENTAL COSTS AS % OF GDP (3)	0.02	0.04	0.06	0.08	0.10	0.12	0.12	0.12	0.11	0.11

(3) in constant prices (market)

SIMTAB TABLE:

GERMANY — DIFFERENCES FROM BASELINE:MSP(3)-MSP(1)

VARIABLE	82	83	84	85	86	87	88	89	90	91	92
CURRENT BALANCE(BILL $)	-0.00	-0.12	-0.22	-0.26	-0.18	-0.20	-0.28	-0.15	0.01	0.04	-0.13
EXCHANGE RATE											
US $ RATE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EFFECTIVE RATE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
REL EXPORT PRICES-MANUF	0.00	0.02	0.07	0.11	0.13	0.09	0.05	0.01	-0.02	-0.03	-0.02
MARKET GROWTH	0.00	0.09	0.15	0.15	0.12	0.08	0.05	-0.06	-0.11	-0.11	-0.09
OECD REAL GDP	0.00	0.03	0.05	0.06	0.05	0.04	0.04	0.01	-0.01	-0.00	0.00
REST OF OECD-REAL GDP	0.00	0.02	0.04	0.04	0.04	0.04	0.04	0.02	0.01	0.00	0.00
OECD GDP DEFLATOR	0.00	0.03	0.07	0.11	0.16	0.20	0.23	0.23	0.24	0.24	0.24
NOMINAL GDP/GNP	0.00	0.30	0.55	0.70	0.64	0.51	0.45	0.24	0.14	0.14	0.25
MONEY SUPPLY	0.00	0.19	0.45	0.69	0.77	0.68	0.57	0.40	0.26	0.18	0.20
VELOCITY	0.00	0.11	0.10	0.01	-0.13	-0.17	-0.13	-0.16	-0.12	-0.03	0.05
INTEREST RATES											
SHORT TERM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LONG TERM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
REAL LONG TERM	0.00	-0.05	-0.11	-0.16	-0.12	-0.05	0.02	0.07	0.08	0.07	0.03
FINANCIAL BALANCES(3)											
GOVT.	0.00	0.05	0.12	0.17	0.18	0.15	0.13	0.09	0.05	0.03	0.05
BUSINESS	0.00	-0.09	-0.20	-0.25	-0.21	-0.17	-0.15	-0.08	-0.03	-0.03	-0.03
HOUSEHOLDS	0.00	0.03	0.04	0.03	0.01	-0.01	-0.01	-0.02	-0.02	-0.00	0.02
FOREIGN	0.00	-0.02	-0.04	-0.04	-0.03	-0.02	-0.02	-0.01	-0.00	0.00	-0.01
HOUSEHOLD SAVINGS RATIO	0.00	0.04	0.07	0.07	0.03	-0.00	-0.01	-0.04	-0.04	-0.02	0.01
DISCRETIONARY FISCAL POLICY CHANGES(3)	0.00	0.02	0.03	0.05	0.06	0.06	0.05	0.04	0.03	0.03	0.03

(3)% OF BASELINE GDP

.. INDICATES NOT APPLICABLE

SIMPAC TABLES

ITALY — DIFFERENCES FROM BASELINE: MSP(3)-MSP(1)

VARIABLE	82	83	84	85	86	87	88	89	90	91	92
PRIVATE CONSUMPTION	0.00	-0.02	-0.02	-0.02	-0.03	-0.03	-0.04	-0.02	-0.01	-0.01	-0.1?
GOVT CONSUMPTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FIXED INVESTMENT:TOTAL	0.00	0.62	0.72	0.73	0.78	0.68	0.61	0.10	0.02	-0.05	-0.03
GOVERNMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL PRIVATE	0.00	0.79	0.90	0.97	0.96	0.84	0.76	0.12	0.02	-0.06	-0.10
RESIDENTIAL	0.00	0.12	0.39	0.51	0.32	-0.05	-0.33	-0.47	-0.57	-0.59	-0.45
BUSINESS	0.00	0.13	0.25	0.34	0.42	0.41	0.41	0.31	0.21	0.10	0.01
STOCKBUILDING(1)	0.00	-0.00	-0.00	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	0.00	0.00
TOTAL DOMESTIC DEMAND	0.00	0.09	0.12	0.14	0.14	0.12	0.11	0.04	0.03	0.02	0.01
REAL FOREIGN BALANCE(1)	0.00	-0.02	-0.03	-0.04	-0.05	-0.05	-0.04	-0.01	0.01	0.02	0.03
EXPORTS(G & S)	0.00	0.04	0.05	0.03	-0.00	-0.04	-0.04	-0.08	-0.07	-0.02	0.02
IMPORTS(G & S)	0.00	0.15	0.21	0.21	0.19	0.15	0.11	-0.03	-0.09	-0.09	-0.08
GDP/GNP(REAL)	0.00	0.07	0.08	0.09	0.08	0.07	0.07	0.02	0.03	0.04	0.04
INDUSTRIAL PRODUCTION	0.00	0.09	0.11	0.12	0.11	0.10	0.09	0.03	0.03	0.04	0.04
TOTAL EMPLOYMENT	0.00	0.02	0.02	0.02	0.02	0.01	0.01	-0.00	0.00	0.01	0.01
UNEMPLOYMENT RATE(2)	0.00	-0.02	-0.02	-0.02	-0.02	-0.01	-0.01	0.00	-0.00	-0.01	-0.01
DEFLATORS:											
PRIVATE CONSUMPTION	0.00	0.19	0.30	0.37	0.40	0.39	0.37	0.20	0.10	0.05	0.06
TOTAL DOM. DEMAND	0.00	0.19	0.30	0.37	0.40	0.39	0.37	0.20	0.10	0.05	0.06
EXPORTS	0.00	0.08	0.17	0.24	0.31	0.34	0.35	0.23	0.21	0.17	0.16
IMPORTS	0.00	0.05	0.11	0.18	0.28	0.32	0.34	0.29	0.25	0.23	0.22
GDP/GNP	0.00	0.20	0.32	0.39	0.42	0.40	0.38	0.20	0.09	0.03	0.04
WAGE RATE	0.00	0.16	0.32	0.41	0.46	0.46	0.44	0.29	0.17	0.11	0.12
COMPENSATION/EMPLOYEE	0.00	0.13	0.27	0.36	0.40	0.40	0.38	0.25	0.14	0.08	0.09

(1) % OF BASELINE GDPV

(2) CHANGE IN % RATE

.. INDICATES NOT APPLICABLE

ENVIRONMENTAL INVESTMENTS AS % OF GDP (3)	0.08	0.08	0.08	0.08	0.08	0.07	0.00	0.00	0.00	0.00
ENVIRONMENTAL COSTS AS % OF GDP (3)	0.01	0.02	0.04	0.05	0.06	0.07	0.07	0.07	0.07	0.07

(3) in constant prices (market)

SIMTAB TABLE:

ITALY — DIFFERENCES FROM BASELINE:WSP(3)-WSP(1)

VARIABLE	82	83	84	85	86	87	88	89	90	91	92
CURRENT BALANCE(BILL $)	0.00	-0.06	-0.11	-0.15	-0.20	-0.25	-0.28	-0.17	-0.12	-0.06	0.02
EXCHANGE RATE											
US $ RATE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EFFECTIVE RATE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
REL EXPORT PRICES-MANUF	0.00	0.02	0.06	0.07	0.07	0.06	0.04	0.00	-0.05	-0.07	-0.07
MARKET GROWTH	0.00	0.09	0.13	0.16	0.13	0.07	0.04	-0.06	-0.12	-0.12	-0.08
OECD REAL GDP	0.00	0.03	0.05	0.06	0.05	0.04	0.04	0.01	-0.00	-0.00	0.00
REST OF OECD-REAL GDP	0.00	0.03	0.05	0.06	0.05	0.04	0.04	0.01	-0.00	-0.00	0.00
OECD GDP DEFLATOR	0.00	0.03	0.07	0.11	0.16	0.20	0.23	0.23	0.24	0.24	0.24
NOMINAL GDP/GNP	0.00	0.27	0.40	0.43	0.50	0.48	0.45	0.23	0.12	0.07	0.08
MONEY SUPPLY	0.00	0.21	0.36	0.46	0.52	0.55	0.56	0.37	0.24	0.16	0.16
VELOCITY	0.00	0.05	0.04	0.02	-0.02	-0.07	-0.11	-0.15	-0.12	-0.09	-0.08
INTEREST RATES											
SHORT TERM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LONG TERM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
REAL LONG TERM	0.00	-0.06	-0.12	-0.14	-0.08	-0.03	0.00	0.07	0.12	0.12	0.06
FINANCIAL BALANCES(3)											
GOVT.	0.00	0.03	0.07	0.10	0.12	0.13	0.14	0.13	0.11	0.11	0.12
BUSINESS	0.00	-0.06	-0.12	-0.15	-0.17	-0.19	-0.21	-0.17	-0.14	-0.13	-0.13
HOUSEHOLDS	0.00	0.02	0.02	0.01	0.02	0.03	0.03	0.02	0.02	0.02	0.01
FOREIGN	0.00	-0.02	-0.03	-0.04	-0.04	-0.04	-0.04	-0.02	-0.01	-0.00	0.01
HOUSEHOLD SAVINGS RATIO	0.00	0.01	0.01	-0.01	-0.01	-0.02	-0.02	-0.02	-0.01	-0.01	-0.01
DISCRETIONARY FISCAL POLICY CHANGES(3)	0.00	0.02	0.03	0.03	0.04	0.04	0.04	0.02	0.01	0.01	0.01

(3)% OF BASELINE GDP

.. INDICATES NOT APPLICABLE

SIMTAB TABLE:

UNTD KINGDOM — DIFFERENCES FROM BASELINE:WSP(3)-WSP(1)

VARIABLE	82	83	84	85	86	87	88	89	90	91	92
PRIVATE CONSUMPTION	0.00	-0.01	0.01	-0.01	-0.03	-0.05	-0.07	-0.09	-0.12	-0.12	-0.12
GOVT CONSUMPTION	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
FIXED INVESTMENT:TOTAL	0.00	0.63	0.70	0.72	0.74	0.73	0.68	0.11	-0.05	-0.12	-0.16
GOVERNMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL PRIVATE	0.00	0.87	0.95	0.93	0.93	0.92	0.86	0.13	-0.06	-0.14	-0.20
RESIDENTIAL	0.00	0.05	0.17	0.25	0.23	0.17	0.09	-0.06	-0.24	-0.35	-0.40
BUSINESS	0.00	0.15	0.31	0.33	0.36	0.37	0.34	0.18	-0.01	-0.09	-0.15
STOCKBUILDING(1)	0.00	0.00	0.00	-0.02	-0.02	-0.02	-0.01	-0.02	-0.01	0.01	0.02
TOTAL DOMESTIC DEMAND	0.00	0.12	0.16	0.13	0.13	0.12	0.12	-0.01	-0.05	-0.04	-0.05
REAL FOREIGN BALANCE(1)	0.00	-0.03	-0.05	-0.06	-0.07	-0.09	-0.10	-0.06	-0.03	0.00	0.04
EXPORTS(G & S)	0.00	0.05	0.06	0.01	-0.08	-0.17	-0.24	-0.31	-0.31	-0.23	-0.11
IMPORTS(G & S)	0.00	0.16	0.24	0.22	0.13	0.14	0.09	-0.11	-0.21	-0.22	-0.22
GDP/GNP(REAL)	0.00	0.09	0.10	0.07	0.05	0.03	0.02	-0.06	-0.07	-0.04	-0.01
INDUSTRIAL PRODUCTION	0.00	0.11	0.13	0.10	0.07	0.05	0.03	-0.07	-0.08	-0.05	-0.02
TOTAL EMPLOYMENT	0.00	0.03	0.06	0.06	0.03	0.01	-0.01	-0.05	-0.08	-0.06	-0.02
UNEMPLOYMENT RATE(2)	0.01	-0.03	-0.05	-0.05	-0.03	-0.00	0.01	0.03	0.07	0.06	0.03
DEFLATORS:											
PRIVATE CONSUMPTION	0.00	0.17	0.30	0.42	0.52	0.57	0.58	0.42	0.26	0.11	0.01
TOTAL DOM. DEMAND	0.00	0.17	0.32	0.44	0.54	0.58	0.58	0.43	0.27	0.12	0.01
EXPORTS	0.00	0.07	0.19	0.32	0.46	0.53	0.56	0.50	0.39	0.26	0.17
IMPORTS	0.00	0.05	0.12	0.20	0.30	0.35	0.37	0.35	0.30	0.24	0.21
GDP/GNP	0.00	0.18	0.34	0.43	0.59	0.64	0.65	0.49	0.29	0.12	0.00
WAGE RATE	0.00	0.09	0.28	0.41	0.54	0.58	0.58	0.47	0.26	0.08	-0.03
COMPENSATION/EMPLOYEE	0.00	0.09	0.27	0.42	0.52	0.57	0.57	0.47	0.27	0.09	-0.03

(1)% OF BASELINE GDPV

(2)CHANGE IN % RATE

.. INDICATES NOT APPLICABLE

ENVIRONMENTAL INVESTMENTS AS % OF GDP (3)	0.09	0.09	0.09	0.09	0.08	0.08	0.00	0.00	0.00	0.00
ENVIRONMENTAL COSTS AS % OF GDP (3)	0.01	0.03	0.05	0.07	0.09	0.11	0.11	0.11	0.11	0.12

(3) in constant prices (market)

SIMTAB TABLE:

UNTD KINGDOM — DIFFERENCES FROM BASELINE:MSP(3)-MSP(1)

VARIABLE	32	33	34	35	86	87	88	89	90	91	92
CURRENT BALANCE(BILL $)	-0.00	-0.11	-0.16	-0.13	-0.21	-0.31	-0.39	-0.24	-0.16	-0.14	0.04
EXCHANGE RATE											
US $ RATE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EFFECTIVE RATE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
REL EXPORT PRICES-MANUF	0.00	0.02	0.11	0.21	0.29	0.34	0.36	0.32	0.20	0.07	-0.03
MARKET GROWTH	0.00	0.09	0.14	0.15	0.12	0.07	0.04	-0.06	-0.12	-0.11	-0.03
OECD REAL GDP	0.00	0.03	0.05	0.06	0.05	0.04	0.04	0.01	-0.00	-0.00	0.00
REST OF OECD-REAL GDP	0.00	0.03	0.05	0.06	0.05	0.04	0.04	0.02	0.00	0.00	0.01
OECD GDP DEFLATOR	0.00	0.03	0.07	0.11	0.16	0.20	0.23	0.23	0.24	0.24	0.24
NOMINAL GDP/GNP	0.00	0.26	0.44	0.55	0.64	0.68	0.67	0.41	0.22	0.08	-0.01
MONEY SUPPLY	0.00	0.07	0.22	0.36	0.45	0.52	0.56	0.52	0.39	0.25	0.14
VELOCITY	0.00	0.20	0.22	0.19	0.19	0.16	0.11	-0.11	-0.17	-0.17	-0.15
INTEREST RATES											
SHORT TERM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LONG TERM	0.00	0.00	0.00	0.00	0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
REAL LONG TERM	0.00	-0.05	-0.12	-0.16	-0.14	-0.11	-0.06	0.03	0.13	0.13	0.17
FINANCIAL BALANCES(3)											
GOVT.	0.00	0.02	0.07	0.09	0.09	0.10	0.11	0.10	0.08	0.09	0.11
BUSINESS	0.00	-0.05	-0.12	-0.13	-0.13	-0.14	-0.16	-0.12	-0.03	-0.03	-0.02
HOUSEHOLDS	0.00	0.01	0.02	0.02	0.01	0.01	0.01	0.00	-0.01	-0.00	-0.00
FOREIGN	0.00	-0.02	-0.03	-0.02	-0.03	-0.04	-0.04	-0.01	-0.00	0.00	0.02
HOUSEHOLD SAVINGS RATIO	0.00	0.00	0.01	0.00	-0.00	-0.01	-0.01	-0.01	-0.02	-0.01	-0.01
DISCRETIONARY FISCAL POLICY CHANGES(3)	0.00	0.02	0.04	0.05	0.07	0.07	0.07	0.05	0.03	0.02	0.01

(3)% OF BASELINE GDP

.. INDICATES NOT APPLICABLE

SIMPACT TABLE:

BELGIUM — DIFFERENCES FROM BASELINE: MSP(3)-MSP(1)

VARIABLE	82	83	84	85	86	87	88	89	90	91	92
PRIVATE CONSUMPTION	0.00	0.02	0.04	0.03	0.02	0.00	-0.02	-0.05	-0.08	-0.08	-0.07
GOVT CONSUMPTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FIXED INVESTMENT: TOTAL	0.00	0.38	0.47	0.51	0.49	0.44	0.40	0.05	-0.06	-0.11	-0.13
GOVERNMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL PRIVATE	0.00	0.46	0.55	0.59	0.55	0.49	0.44	0.05	-0.06	-0.12	-0.15
RESIDENTIAL	0.00	0.03	0.11	0.22	0.34	0.41	0.45	0.41	0.32	0.19	0.06
BUSINESS	0.00	0.23	0.34	0.37	0.31	0.22	0.15	-0.06	-0.17	-0.21	-0.20
STOCKBUILDING(1)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL DOMESTIC DEMAND	0.00	0.08	0.11	0.12	0.11	0.10	0.08	-0.00	-0.04	-0.05	-0.06
REAL FOREIGN BALANCE(1)	0.00	0.01	0.03	0.04	0.04	0.03	0.03	0.02	0.01	0.00	0.01
EXPORTS(G & S)	0.00	0.10	0.19	0.20	0.17	0.11	0.08	-0.04	-0.12	-0.13	-0.11
IMPORTS(G & S)	0.00	0.10	0.15	0.16	0.12	0.07	0.04	-0.08	-0.13	-0.14	-0.12
GDP/GNP(REAL)	0.00	0.08	0.13	0.15	0.14	0.12	0.10	0.02	-0.03	-0.05	-0.05
INDUSTRIAL PRODUCTION	0.00	0.10	0.15	0.17	0.16	0.14	0.12	0.03	-0.04	-0.06	-0.07
TOTAL EMPLOYMENT	0.00	0.02	0.05	0.08	0.08	0.08	0.07	0.05	0.02	-0.01	-0.01
UNEMPLOYMENT RATE(2)	0.00	-0.02	-0.05	-0.07	-0.07	-0.07	-0.06	-0.04	-0.01	0.01	0.01
DEFLATORS:											
PRIVATE CONSUMPTION	0.00	0.02	0.06	0.11	0.17	0.23	0.28	0.32	0.33	0.33	0.32
TOTAL DOM. DEMAND	0.00	0.02	0.05	0.11	0.17	0.23	0.28	0.31	0.33	0.33	0.32
EXPORTS	0.00	0.01	0.05	0.11	0.18	0.23	0.27	0.29	0.30	0.28	0.27
IMPORTS	0.00	0.02	0.07	0.14	0.22	0.27	0.30	0.32	0.31	0.29	0.27
GDP/GNP	0.00	0.01	0.04	0.09	0.14	0.20	0.25	0.30	0.32	0.32	0.31
WAGE RATE	0.00	0.01	0.05	0.10	0.17	0.22	0.27	0.30	0.32	0.31	0.29
COMPENSATION/EMPLOYEE	0.00	0.03	0.07	0.12	0.19	0.24	0.29	0.31	0.32	0.32	0.31

(1) % OF BASELINE GDPV

(2) CHANGE IN % RATE

.. INDICATES NOT APPLICABLE

ENVIRONMENTAL INVESTMENTS AS % OF GDP (3)	0.04	0.04	0.04	0.03	0.03	0.03	0.00	0.00	0.00	0.00
ENVIRONMENTAL COSTS AS % OF GDP (3)	0.00	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02

(3) in constant prices (market)

SIMTAB TABLE:

BELGIUM — DIFFERENCES FROM BASELINE:MSP(3)-MSP(1)

VARIABLE	82	83	84	85	86	87	88	89	91	91	92
CURRENT BALANCE(BILL $)	0.00	-0.00	0.01	0.01	0.02	0.02	0.03	0.03	0.04	0.03	0.04
EXCHANGE RATE											
US $ RATE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EFFECTIVE RATE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
REL EXPORT PRICES-MANUF	0.00	-0.01	-0.02	-0.03	-0.04	-0.03	-0.02	-0.01	0.01	0.03	0.03
MARKET GROWTH	0.00	0.13	0.22	0.22	0.16	0.10	0.06	-0.07	-0.15	-0.14	-0.10
OECD REAL GDP	0.00	0.03	0.05	0.06	0.05	0.04	0.04	0.01	-0.00	-0.00	0.00
REST OF OECD-REAL GDP	0.00	0.03	0.05	0.06	0.05	0.04	0.04	0.01	0.00	-0.00	0.01
OECD GDP DEFLATOR	0.00	0.03	0.07	0.11	0.16	0.20	0.23	0.23	0.24	0.24	0.24
NOMINAL GDP/GNP	0.00	0.09	0.17	0.24	0.29	0.33	0.36	0.32	0.29	0.27	0.26
MONEY SUPPLY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VELOCITY	0.00	0.09	0.17	0.24	0.29	0.33	0.36	0.32	0.29	0.27	0.26
INTEREST RATES											
SHORT TERM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LONG TERM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.00	-0.00	-0.00
REAL LONG TERM	0.00	-0.01	-0.02	-0.05	-0.06	-0.06	-0.05	-0.04	-0.03	-0.01	0.01
FINANCIAL BALANCES(3)											
GOVT.	0.00	0.02	0.05	0.07	0.08	0.08	0.08	0.06	0.04	0.02	0.02
BUSINESS	0.00	-0.03	-0.05	-0.06	-0.06	-0.06	-0.06	-0.04	-0.02	-0.02	-0.02
HOUSEHOLDS	0.00	0.01	0.01	0.00	-0.00	-0.01	-0.01	-0.01	-0.01	-0.00	0.00
FOREIGN	0.00	-0.00	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01
HOUSEHOLD SAVINGS RATIO	0.00	0.01	0.00	-0.00	-0.01	-0.01	-0.01	-0.02	-0.01	-0.01	-0.01
DISCRETIONARY FISCAL POLICY CHANGES(3)	0.00	0.00	0.00	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02

(3)% OF BASELINE GDP

.. INDICATES NOT APPLICABLE

SIMTAB TABLE:

DENMARK

DIFFERENCES FROM BASELINE:MSP(3)-MSP(1)

VARIABLE	82	83	84	85	86	87	88	89	90	91	92
PRIVATE CONSUMPTION	0.00	0.05	0.05	0.02	-0.01	-0.03	-0.05	-0.12	-0.15	-0.16	-0.18
GOVT CONSUMPTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FIXED INVESTMENT:TOTAL	0.00	1.04	1.01	0.91	0.76	0.79	0.82	-0.01	-0.09	-0.13	-0.16
GOVERNMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL PRIVATE	0.00	1.20	1.15	1.04	0.86	0.83	0.84	-0.01	-0.10	-0.15	-0.18
RESIDENTIAL	0.00	0.04	0.11	0.22	0.25	0.29	0.34	0.31	0.23	0.11	-0.00
BUSINESS	0.00	0.57	0.58	0.48	0.35	0.33	0.33	-0.11	-0.22	-0.24	-0.24
STOCKBUILDING(1)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL DOMESTIC DEMAND	0.00	0.22	0.24	0.23	0.22	0.22	0.22	0.03	-0.01	-0.02	-0.03
REAL FOREIGN BALANCE(1)	0.00	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	0.00	0.01	0.01	0.01
EXPORTS(G & S)	0.00	0.06	0.10	0.10	0.07	0.03	-0.00	-0.08	-0.13	-0.13	-0.11
IMPORTS(G & S)	0.00	0.22	0.26	0.24	0.20	0.16	0.13	-0.09	-0.15	-0.16	-0.15
GDP/GNP(REAL)	0.00	0.16	0.18	0.18	0.17	0.17	0.17	0.04	-0.00	-0.01	-0.02
INDUSTRIAL PRODUCTION	0.00	0.20	0.22	0.21	0.20	0.20	0.20	0.03	-0.02	-0.03	-0.04
TOTAL EMPLOYMENT	0.00	0.02	0.04	0.05	0.05	0.06	0.06	0.05	0.04	0.03	0.04
UNEMPLOYMENT RATE(2)	0.00	-0.02	-0.04	-0.05	-0.05	-0.05	-0.06	-0.05	-0.03	-0.03	-0.03
DEFLATORS:											
PRIVATE CONSUMPTION	0.00	0.04	0.10	0.17	0.23	0.29	0.35	0.37	0.37	0.35	0.34
TOTAL DOM. DEMAND	0.00	0.04	0.09	0.17	0.21	0.26	0.32	0.34	0.34	0.32	0.31
EXPORTS	0.00	0.02	0.07	0.13	0.19	0.23	0.27	0.29	0.29	0.28	0.27
IMPORTS	0.00	0.02	0.08	0.15	0.23	0.28	0.31	0.31	0.29	0.26	0.25
GDP/GNP	0.00	0.04	0.09	0.15	0.20	0.26	0.31	0.33	0.33	0.32	0.31
WAGE RATE	0.00	0.03	0.09	0.13	0.26	0.33	0.40	0.44	0.45	0.44	0.42
COMPENSATION/EMPLOYEE	0.00	0.09	0.14	0.21	0.26	0.32	0.37	0.33	0.33	0.31	0.29

(1)% OF BASELINE GDPV

(2)CHANGE IN % RATE

.. INDICATES NOT APPLICABLE

ENVIRONMENTAL INVESTMENTS AS % OF GDP (3)	0.11	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00
ENVIRONMENTAL COSTS AS % OF GDP (3)	0.02	0.04	0.05	0.07	0.08	0.10	0.10	0.10	0.10	0.09

(3) in constant prices (market)

SIMTAB TABLE:

DENMARK — DIFFERENCES FROM BASELINE:WSP(3)-WSP(1)

VARIABLE	82	83	84	85	86	87	88	89	90	91	92
CURRENT BALANCE(BILL $)	0.00	-0.04	-0.04	-0.05	-0.07	-0.08	-0.09	-0.04	-0.03	-0.02	-0.01
EXCHANGE RATE											
US $ RATE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EFFECTIVE RATE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
REL EXPORT PRICES-MANUF	0.00	-0.00	-0.01	-0.01	-0.02	-0.02	-0.01	0.00	0.01	0.02	0.02
MARKET GROWTH	0.00	0.11	0.19	0.19	0.14	0.08	0.04	-0.09	-0.16	-0.15	-0.12
OECD REAL GDP	0.00	0.03	0.05	0.06	0.05	0.04	0.04	0.01	-0.00	-0.00	0.00
REST OF OECD-REAL GDP	0.00	0.03	0.05	0.06	0.05	0.04	0.04	0.01	-0.00	-0.00	0.00
OECD GDP DEFLATOR	0.00	0.03	0.07	0.11	0.16	0.20	0.23	0.23	0.24	0.24	0.24
NOMINAL GDP/GNP	0.00	0.19	0.27	0.33	0.37	0.43	0.49	0.36	0.33	0.31	0.29
MONEY SUPPLY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VELOCITY	0.00	0.19	0.27	0.33	0.37	0.43	0.49	0.36	0.33	0.31	0.29
INTEREST RATES											
SHORT TERM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LONG TERM	0.00	0.00	0.00	0.00	-0.00	0.00	0.00	-0.00	-0.00	-0.00	-0.00
REAL LONG TERM	0.00	-0.01	-0.04	-0.07	-0.06	-0.05	-0.05	-0.04	-0.01	0.01	0.01
FINANCIAL BALANCES(3)											
GOVT.	0.00	0.05	0.09	0.11	0.12	0.12	0.13	0.09	0.06	0.05	0.05
BUSINESS	0.00	-0.13	-0.15	-0.16	-0.16	-0.16	-0.16	-0.06	-0.04	-0.04	-0.04
HOUSEHOLDS	0.00	0.02	-0.00	-0.01	-0.02	-0.01	-0.01	-0.02	-0.01	0.00	0.01
FOREIGN	0.00	-0.06	-0.06	-0.06	-0.06	-0.05	-0.05	0.00	0.01	0.01	0.02
HOUSEHOLD SAVINGS RATIO	0.00	0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	-0.00	0.01	0.01
DISCRETIONARY FISCAL POLICY CHANGES(3)	0.00	0.00	0.01	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03

(3)% OF BASELINE GDP

.. INDICATES NOT APPLICABLE

SIMTAB TABLES

GREECE — DIFFERENCES FROM BASELINE:WSP(3)-WSP(1)

VARIABLE	82	83	84	85	86	87	88	89	90	91	92
PRIVATE CONSUMPTION	0.00	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.00	0.00	0.00
GOVT CONSUMPTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FIXED INVESTMENT:TOTAL	0.00	0.11	0.14	0.15	0.17	0.19	0.20	0.07	0.03	0.03	0.03
GOVERNMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL PRIVATE	0.00	0.05	0.08	0.09	0.11	0.13	0.13	0.07	0.03	0.03	0.03
RESIDENTIAL	..	..	..	..	..	..	..	..	..	..	..
BUSINESS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STOCKBUILDING(1)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL DOMESTIC DEMAND	0.00	0.03	0.04	0.04	0.04	0.05	0.06	0.04	0.03	0.03	0.03
REAL FOREIGN BALANCE(1)	0.00	0.00	0.01	0.01	0.02	0.03	0.03	0.03	0.02	0.02	0.02
EXPORTS(G & S)	0.00	0.06	0.12	0.16	0.16	0.14	0.12	0.06	0.01	0.01	0.01
IMPORTS(G & S)	0.00	0.04	0.07	0.07	0.05	0.02	-0.00	-0.05	-0.07	-0.07	-0.05
GDP/GNP(REAL)	0.00	0.03	0.05	0.05	0.07	0.08	0.09	0.06	0.05	0.05	0.05
INDUSTRIAL PRODUCTION	0.00	0.03	0.04	0.05	0.06	0.08	0.09	0.06	0.05	0.04	0.05
TOTAL EMPLOYMENT	0.00	0.01	0.02	0.02	0.03	0.03	0.04	0.03	0.02	0.02	0.02
UNEMPLOYMENT RATE(2)	0.00	-0.01	-0.02	-0.02	-0.02	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02
DEFLATORS:											
PRIVATE CONSUMPTION	0.00	0.01	0.03	0.06	0.09	0.11	0.13	0.14	0.13	0.12	0.12
TOTAL DOM. DEMAND	0.00	0.01	0.04	0.06	0.10	0.12	0.14	0.14	0.13	0.13	0.12
EXPORTS	0.00	0.02	0.05	0.08	0.13	0.18	0.21	0.22	0.22	0.21	0.21
IMPORTS	0.00	0.02	0.06	0.12	0.22	0.25	0.28	0.29	0.23	0.26	0.24
GDP/GNP	0.00	0.01	0.03	0.05	0.07	0.10	0.12	0.12	0.11	0.11	0.11
WAGE RATE	0.00	0.01	0.02	0.05	0.07	0.10	0.12	0.13	0.12	0.11	0.11
COMPENSATION/EMPLOYEE	0.00	0.01	0.04	0.06	0.10	0.14	0.16	0.17	0.16	0.16	0.16

(1)% OF BASELINE GDPV

(2)CHANGE IN % RATE

.. INDICATES NOT APPLICABLE

ENVIRONMENTAL INVESTMENTS AS % OF GDP (3)	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
ENVIRONMENTAL COSTS AS % OF GDP (3)	0.00	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02

(3) in constant prices (market)

SIMTAB TABLE:

GREECE — DIFFERENCES FROM BASELINE:WSP(3)-WSP(1)

VARIABLE	82	83	84	85	86	87	88	89	90	91	92
CURRENT BALANCE(BILL $)	0.00	-0.00	-0.00	-0.00	-0.01	-0.00	-0.00	-0.00	-0.00	-0.00	0.00
EXCHANGE RATE											
US $ RATE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EFFECTIVE RATE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
REL EXPORT PRICES-MANUF	0.00	-0.01	-0.01	-0.03	-0.01	-0.03	-0.03	-0.03	-0.02	-0.01	-0.01
MARKET GROWTH	0.00	0.10	0.18	0.20	0.16	0.10	0.06	-0.06	-0.13	-0.13	-0.08
OECD REAL GDP	0.00	0.03	0.05	0.06	0.05	0.04	0.04	0.01	-0.00	-0.00	0.00
REST OF OECD-REAL GDP	0.00	0.03	0.05	0.06	0.05	0.04	0.04	0.01	-0.00	-0.00	0.00
OECD GDP DEFLATOR	0.00	0.03	0.07	0.11	0.16	0.20	0.23	0.23	0.24	0.24	0.24
NOMINAL GDP/GNP	0.00	0.04	0.08	0.10	0.14	0.18	0.21	0.18	0.16	0.16	0.16
MONEY SUPPLY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VELOCITY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INTEREST RATES											
SHORT TERM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LONG TERM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
REAL LONG TERM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FINANCIAL BALANCES(3)											
GOVT.	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	-0.00	-0.00	0.00
BUSINESS	0.00	-0.01	-0.02	-0.03	-0.03	-0.03	-0.03	-0.02	-0.02	-0.01	-0.01
HOUSEHOLDS	0.00	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.01	0.02	0.02
FOREIGN	0.00	-0.00	-0.00	-0.01	-0.01	-0.00	-0.00	-0.00	-0.00	-0.00	0.00
HOUSEHOLD SAVINGS RATIO	0.00	0.00	0.00	-0.00	-0.00	0.00	0.00	-0.00	-0.00	0.00	0.00
DISCRETIONARY FISCAL POLICY CHANGES(3)	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01

(3)% OF BASELINE GDP

.. INDICATES NOT APPLICABLE

SIMTAB TABLE:

IRELAND — DIFFERENCES FROM BASELINE:WSP(3)-WSP(1)

VARIABLE	82	83	84	85	86	87	88	89	90	91	92
PRIVATE CONSUMPTION	0.00	0.04	0.06	0.03	0.01	-0.05	-0.11	-0.21	-0.29	-0.32	-0.33
GOVT CONSUMPTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FIXED INVESTMENT:TOTAL	0.00	0.71	0.84	0.95	1.02	0.94	0.80	-0.07	-0.31	-0.47	-0.54
GOVERNMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL PRIVATE	0.00	0.71	0.84	0.95	1.02	0.94	0.80	-0.07	-0.31	-0.47	-0.54
RESIDENTIAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BUSINESS	0.00	0.42	0.47	0.44	0.31	0.10	-0.10	-0.55	-0.71	-0.68	-0.54
STOCKBUILDING(1)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL DOMESTIC DEMAND	0.00	0.21	0.26	0.27	0.30	0.26	0.21	-0.05	-0.15	-0.20	-0.23
REAL FOREIGN BALANCE(1)	0.00	-0.10	-0.13	-0.16	-0.21	-0.23	-0.23	-0.11	-0.06	-0.00	0.05
EXPORTS(G & S)	0.00	0.09	0.13	0.11	0.04	-0.04	-0.11	-0.26	-0.33	-0.31	-0.25
IMPORTS(G & S)	0.00	0.23	0.30	0.32	0.32	0.25	0.16	-0.13	-0.27	-0.32	-0.32
GDP/GNP(REAL)	0.00	0.14	0.17	0.17	0.13	0.07	0.01	-0.16	-0.23	-0.24	-0.21
INDUSTRIAL PRODUCTION	0.00	0.15	0.17	0.17	0.13	0.06	-0.01	-0.19	-0.26	-0.26	-0.24
TOTAL EMPLOYMENT	0.00	0.02	0.06	0.07	0.07	0.06	0.04	0.00	-0.04	-0.05	-0.04
UNEMPLOYMENT RATE(2)	0.00	-0.02	-0.05	-0.06	-0.06	-0.05	-0.03	-0.00	0.03	0.04	0.03
DEFLATORS:											
PRIVATE CONSUMPTION	0.00	0.07	0.21	0.41	0.57	0.69	0.77	0.75	0.64	0.49	0.34
TOTAL DOM. DEMAND	0.00	0.06	0.20	0.39	0.54	0.65	0.73	0.72	0.61	0.45	0.31
EXPORTS	0.00	0.02	0.10	0.22	0.34	0.43	0.49	0.50	0.46	0.37	0.30
IMPORTS	0.00	0.04	0.14	0.28	0.41	0.50	0.55	0.53	0.44	0.33	0.24
GDP/GNP	0.00	0.05	0.18	0.36	0.52	0.65	0.72	0.70	0.61	0.46	0.32
WAGE RATE	0.00	0.06	0.20	0.41	0.58	0.69	0.76	0.73	0.59	0.40	0.23
COMPENSATION/EMPLOYEE	0.00	0.05	0.19	0.40	0.57	0.71	0.79	0.77	0.64	0.46	0.30

(1)% OF BASELINE GDPV

(2)CHANGE IN % RATE

.. INDICATES NOT APPLICABLE

ENVIRONMENTAL INVESTMENTS AS % OF GDP (3)	0.14	0.13	0.13	0.14	0.13	0.13	0.00	0.00	0.00	0.00
ENVIRONMENTAL COSTS AS % OF GDP (3)	0.02	0.04	0.05	0.07	0.09	0.10	0.10	0.10	0.10	0.10

(3) in constant prices (market)

SIMTAB TABLE:

IRELAND — DIFFERENCES FROM BASELINE:WSP(3)-WSP(1)

VARIABLE	82	83	84	85	86	87	88	89	90	91	92
CURRENT BALANCE(BILL $)	0.00	-0.02	-0.03	-0.04	-0.06	-0.08	-0.07	-0.03	-0.04	-0.09	-0.09
EXCHANGE RATE											
US $ RATE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EFFECTIVE RATE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
REL EXPORT PRICES-MANUF	0.00	-0.00	0.01	0.07	0.12	0.17	0.21	0.23	0.20	0.13	0.07
MARKET GROWTH	0.00	0.16	0.25	0.23	0.19	0.12	0.03	-0.10	-0.20	-0.19	-0.17
OECD REAL GDP	0.00	0.03	0.05	0.06	0.05	0.04	0.04	0.01	-0.00	-0.00	0.00
REST OF OECD-REAL GDP	0.00	0.03	0.05	0.06	0.05	0.04	0.04	0.02	0.00	-0.00	0.00
OECD GDP DEFLATOR	0.00	0.03	0.07	0.11	0.16	0.20	0.23	0.23	0.24	0.24	0.24
NOMINAL GDP/GNP	0.00	0.19	0.35	0.53	0.66	0.72	0.74	0.54	0.37	0.22	0.11
MONEY SUPPLY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VELOCITY	0.00	0.19	0.35	0.53	0.66	0.72	0.74	0.54	0.37	0.22	0.11
INTEREST RATES											
SHORT TERM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LONG TERM	0.00	0.00	0.00	0.00	-0.00	0.00	0.00	-0.00	-0.00	-0.00	-0.00
REAL LONG TERM	0.00	-0.03	-0.10	-0.17	-0.17	-0.14	-0.10	-0.03	0.06	0.13	0.15
FINANCIAL BALANCES(3)											
GOVT.	0.00	0.02	0.04	0.04	0.01	-0.01	-0.04	-0.10	-0.16	-0.18	-0.18
BUSINESS	0.00	-0.14	-0.21	-0.22	-0.22	-0.19	-0.14	0.04	0.15	0.22	0.27
HOUSEHOLDS	0.00	0.02	0.02	0.01	0.02	0.01	0.01	-0.01	-0.01	-0.01	-0.01
FOREIGN	0.00	-0.10	-0.14	-0.17	-0.17	-0.19	-0.18	-0.03	-0.02	0.03	0.08
HOUSEHOLD SAVINGS RATIO	0.00	0.01	-0.01	-0.01	-0.01	-0.02	-0.01	-0.02	0.00	0.02	0.02
DISCRETIONARY FISCAL POLICY CHANGES(3)	0.00	0.01	0.02	0.05	0.07	0.08	0.08	0.08	0.07	0.05	0.03

(3)% OF BASELINE GDP

.. INDICATES NOT APPLICABLE

SEMTAB TABLE:

NETHERLANDS — DIFFERENCES FROM BASELINE:WSP(3)-WSP(1)

VARIABLE	82	83	84	85	86	87	88	89	90	91	92
PRIVATE CONSUMPTION	0.00	0.00	0.02	0.03	0.02	-0.00	-0.01	-0.02	-0.03	-0.03	-0.02
GOVT CONSUMPTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FIXED INVESTMENT:TOTAL	0.00	0.50	0.57	0.56	0.43	0.40	0.33	-0.09	-0.14	-0.17	-0.14
GOVERNMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL PRIVATE	0.00	0.59	0.68	0.65	0.55	0.46	0.38	-0.10	-0.19	-0.19	-0.16
RESIDENTIAL	0.00	0.01	0.02	0.03	0.03	0.02	0.01	-0.03	-0.01	-0.02	-0.01
BUSINESS	0.00	0.23	0.37	0.35	0.26	0.14	0.05	-0.14	-0.25	-0.25	-0.20
STOCKBUILDING(1)	0.00	-0.00	0.03	0.02	0.01	-0.01	-0.01	-0.01	-0.03	-0.02	-0.00
TOTAL DOMESTIC DEMAND	0.00	0.10	0.13	0.12	0.15	0.11	0.09	0.00	-0.05	-0.03	-0.00
REAL FOREIGN BALANCE(1)	0.00	-0.01	-0.01	0.01	0.00	-0.01	-0.03	-0.04	-0.05	-0.07	-0.03
EXPORTS(G & S)	0.00	0.09	0.16	0.13	0.13	0.04	-0.01	-0.13	-0.20	-0.21	-0.13
IMPORTS(G & S)	0.00	0.11	0.13	0.13	0.13	0.07	0.03	-0.07	-0.13	-0.10	-0.06
GDP/GNP(REAL)	0.00	0.09	0.16	0.17	0.14	0.10	0.06	-0.03	-0.10	-0.10	-0.03
INDUSTRIAL PRODUCTION	0.00	0.11	0.13	0.12	0.16	0.11	0.07	-0.03	-0.09	-0.09	-0.07
TOTAL EMPLOYMENT	0.00	0.02	0.08	0.12	0.13	0.11	0.06	0.01	-0.04	-0.07	-0.07
UNEMPLOYMENT RATE(2)	0.00	-0.02	-0.06	-0.11	-0.12	-0.09	-0.05	-0.01	0.04	0.06	0.06
DEFLATORS:											
PRIVATE CONSUMPTION	0.00	0.02	0.07	0.14	0.25	0.36	0.42	0.47	0.50	0.49	0.46
TOTAL DOM. DEMAND	0.00	0.01	0.06	0.13	0.23	0.33	0.40	0.46	0.49	0.48	0.44
EXPORTS	0.00	0.01	0.05	0.11	0.22	0.29	0.34	0.33	0.33	0.32	0.34
IMPORTS	0.00	0.02	0.07	0.15	0.25	0.30	0.34	0.35	0.34	0.32	0.30
GDP/GNP	0.00	0.01	0.04	0.11	0.21	0.32	0.40	0.47	0.51	0.51	0.47
WAGE RATE	0.00	0.02	0.07	0.16	0.23	0.39	0.43	0.54	0.56	0.53	0.43
COMPENSATION/EMPLOYEE	0.00	0.02	0.07	0.16	0.28	0.39	0.48	0.54	0.56	0.53	0.43

(1)% OF BASELINE GDPV

(2)CHANGE IN % RATE

.. INDICATES NOT APPLICABLE

ENVIRONMENTAL INVESTMENTS AS % OF GDP (3)	0.07	0.07	0.07	0.07	0.06	0.06	0.00	0.00	0.00	0.00
ENVIRONMENTAL COSTS AS % OF GDP (3)	0.01	0.01	0.02	0.03	0.03	0.04	0.04	0.04	0.04	0.04

(3) in constant prices (market)

SIMTAB TABLE:

NETHERLANDS — DIFFERENCES FROM BASELINE:WSP(3)-WSP(1)

VARIABLE	82	83	84	85	86	87	88	89	90	91	92
CURRENT BALANCE(BILL $)	0.00	-0.02	-0.03	-0.01	-0.02	-0.03	-0.05	-0.04	-0.05	-0.10	-0.15
EXCHANGE RATE											
US $ RATE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
EFFECTIVE RATE	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00
REL EXPORT PRICES-MANUF	0.00	-0.01	-0.03	-0.02	-0.00	0.03	0.06	0.08	0.11	0.11	0.10
MARKET GROWTH	0.00	0.13	0.22	0.23	0.17	0.10	0.06	-0.03	-0.16	-0.15	-0.11
OECD REAL GDP	0.00	0.03	0.05	0.06	0.05	0.04	0.04	0.01	-0.00	-0.00	0.00
REST OF OECD-REAL GDP	0.00	0.03	0.05	0.06	0.05	0.04	0.04	0.02	0.00	0.00	0.01
OECD GDP DEFLATOR	0.00	0.03	0.07	0.11	0.16	0.20	0.23	0.23	0.24	0.24	0.24
NOMINAL GDP/GNP	0.00	0.10	0.20	0.23	0.36	0.42	0.47	0.44	0.41	0.40	0.39
MONEY SUPPLY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VELOCITY	0.00	0.10	0.20	0.23	0.36	0.42	0.47	0.44	0.41	0.40	0.39
INTEREST RATES											
SHORT TERM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LONG TERM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
REAL LONG TERM	0.00	-0.01	-0.03	-0.06	-0.09	-0.10	-0.08	-0.07	-0.04	-0.01	0.02
FINANCIAL BALANCES(3)											
GOVT.	0.00	0.03	0.07	0.10	0.12	0.11	0.09	0.05	0.01	-0.01	-0.02
BUSINESS	0.00	-0.06	-0.11	-0.11	-0.11	-0.11	-0.09	-0.04	-0.01	-0.01	-0.02
HOUSEHOLDS	0.00	0.01	0.02	0.00	-0.01	-0.01	-0.01	-0.01	-0.02	-0.01	-0.00
FOREIGN	0.00	-0.01	-0.02	-0.01	-0.00	-0.00	-0.01	-0.01	-0.01	-0.03	-0.04
HOUSEHOLD SAVINGS RATIO	0.00	0.02	0.03	0.01	-0.00	-0.00	0.01	0.00	-0.01	0.01	0.01
DISCRETIONARY FISCAL POLICY CHANGES(3)	0.00	0.00	0.00	0.01	0.01	0.02	0.03	0.03	0.03	0.03	0.03

(3)% OF BASELINE GDP

.. INDICATES NOT APPLICABLE

SIMTAB TABLE:

SPAIN — DIFFERENCES FROM BASELINE:MSP(3)-MSP(1)

VARIABLE	82	83	84	85	86	87	88	89	90	91	92
PRIVATE CONSUMPTION	0.00	0.02	0.04	0.04	0.04	0.03	0.02	-0.00	-0.02	-0.03	-0.02
GOVT CONSUMPTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FIXED INVESTMENT:TOTAL	0.00	0.24	0.28	0.28	0.24	0.21	0.19	-0.00	-0.02	-0.02	-0.01
GOVERNMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL PRIVATE	0.00	0.07	0.11	0.11	0.08	0.06	0.05	-0.00	-0.02	-0.02	-0.01
RESIDENTIAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BUSINESS	0.00	0.09	0.16	0.15	0.11	0.08	0.07	-0.00	-0.03	-0.03	-0.01
STOCKBUILDING(1)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL DOMESTIC DEMAND	0.00	0.07	0.09	0.10	0.09	0.08	0.03	0.02	0.00	0.00	0.01
REAL FOREIGN BALANCE(1)	0.00	-0.00	0.00	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.03
EXPORTS(G & S)	0.00	0.07	0.12	0.13	0.12	0.08	0.06	-0.01	-0.04	-0.05	-0.01
IMPORTS(G & S)	0.00	0.08	0.12	0.12	0.09	0.05	0.02	-0.00	-0.13	-0.13	-0.12
GDP/GNP(REAL)	0.00	0.06	0.09	0.10	0.10	0.09	0.09	0.04	0.02	0.02	0.03
INDUSTRIAL PRODUCTION	0.00	0.07	0.10	0.10	0.10	0.10	0.10	0.04	0.03	0.03	0.03
TOTAL EMPLOYMENT	0.00	0.02	0.05	0.06	0.05	0.05	0.04	0.01	0.01	0.01	0.01
UNEMPLOYMENT RATE(2)	0.00	-0.02	-0.04	-0.04	-0.04	-0.04	-0.03	-0.01	-0.01	-0.01	-0.01
DEFLATORS:											
PRIVATE CONSUMPTION	0.00	0.03	0.08	0.13	0.17	0.21	0.23	0.23	0.20	0.17	0.14
TOTAL DOM. DEMAND	0.00	0.03	0.07	0.13	0.17	0.20	0.23	0.22	0.20	0.17	0.14
EXPORTS	0.00	0.02	0.06	0.11	0.18	0.22	0.25	0.26	0.24	0.21	0.19
IMPORTS	0.00	0.02	0.07	0.13	0.22	0.28	0.31	0.32	0.30	0.27	0.26
GDP/GNP	0.00	0.02	0.07	0.12	0.16	0.19	0.21	0.21	0.18	0.15	0.12
WAGE RATE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
COMPENSATION/EMPLOYEE	0.00	0.02	0.07	0.12	0.17	0.20	0.23	0.23	0.20	0.17	0.14

(1)% OF BASELINE GDPV

(2)CHANGE IN % RATE

.. INDICATES NOT APPLICABLE

ENVIRONMENTAL INVESTMENTS AS % OF GDP (3)	0.04	0.04	0.04	0.03	0.03	0.03	0.00	0.00	0.00	0.00
ENVIRONMENTAL COSTS AS % OF GDP (3)	0.00	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02

(3) in constant prices (market)

SIMTAB TABLE:

SPAIN — DIFFERENCES FROM BASELINE:WSP(3)-WSP(1)

VARIABLE	82	83	84	85	86	87	88	89	90	91	92
CURRENT BALANCE(BILL $)	-0.00	-0.01	0.00	0.01	0.01	0.00	0.00	0.01	0.01	0.02	0.05
EXCHANGE RATE											
US $ RATE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EFFECTIVE RATE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
REL EXPORT PRICES-MAJOR	0.00	-0.01	-0.02	-0.03	-0.04	-0.05	-0.05	-0.05	-0.05	-0.06	-0.07
MARKET GROWTH	0.00	0.08	0.14	0.15	0.12	0.07	0.04	-0.05	-0.11	-0.10	-0.08
OECD REAL GDP	0.00	0.03	0.05	0.06	0.05	0.04	0.04	0.01	-0.00	-0.00	0.00
REST OF OECD-REAL GDP	0.00	0.03	0.05	0.06	0.05	0.04	0.04	0.01	-0.00	-0.00	0.00
OECD GDP DEFLATOR	0.00	0.03	0.07	0.11	0.16	0.20	0.23	0.23	0.24	0.24	0.24
NOMINAL GDP/GNP	0.00	0.09	0.16	0.22	0.26	0.28	0.30	0.25	0.20	0.18	0.16
MONEY SUPPLY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VELOCITY	0.00	0.09	0.16	0.22	0.25	0.28	0.30	0.25	0.20	0.18	0.16
INTEREST RATES											
SHORT TERM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LONG TERM	0.00	0.00	0.00	0.00	-0.00	0.00	0.00	-0.00	-0.00	-0.00	-0.00
REAL LONG TERM	0.00	-0.01	-0.04	-0.05	-0.05	-0.04	-0.03	-0.01	0.01	0.03	0.03
FINANCIAL BALANCES(3)											
GOVT.	0.00	0.01	0.02	0.03	0.03	0.03	0.03	0.02	0.01	0.01	0.01
BUSINESS	0.00	-0.02	-0.03	-0.03	-0.03	-0.03	-0.03	-0.02	-0.01	-0.01	-0.00
HOUSEHOLDS	0.00	0.01	0.01	0.01	0.01	0.01	0.01	-0.00	0.00	0.00	0.00
FOREIGN	0.00	-0.01	0.00	0.00	0.00	-0.00	-0.00	0.00	0.00	0.01	0.01
HOUSEHOLD SAVINGS RATIO	0.00	0.01	0.01	-0.00	-0.00	-0.00	-0.00	-0.01	-0.00	-0.00	0.00
DISCRETIONARY FISCAL POLICY CHANGES(3)	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01

(3)% OF BASELINE GDP

.. INDICATES NOT APPLICABLE

SIMTAB TABLE:

GERMANY — DIFFERENCES, FROM BASELINE: MSP(3)-MSP(1)

VARIABLE	82	83	84	85	86	87	88	89	90	91	92
PRIVATE CONSUMPTION	0.00	0.01	0.01	0.01	-0.00	-0.01	-0.01	-0.01	-0.02	-0.02	-0.01
GOVT CONSUMPTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FIXED INVESTMENT:TOTAL	0.00	0.23	0.30	0.35	0.31	0.25	0.20	-0.02	-0.07	-0.07	-0.03
GOVERNMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL PRIVATE	0.00	0.26	0.35	0.40	0.36	0.29	0.23	-0.03	-0.09	-0.08	-0.03
RESIDENTIAL	0.00	0.05	0.10	0.14	0.12	0.07	0.03	-0.03	-0.13	-0.10	-0.10
BUSINESS	0.00	0.10	0.20	0.25	0.21	0.13	0.07	-0.03	-0.03	-0.07	-0.00
STOCKBUILDING(1)	0.00	0.00	0.02	0.03	0.01	-0.01	-0.01	-0.01	-0.02	-0.02	0.00
TOTAL DOMESTIC DEMAND	0.00	0.06	0.12	0.14	0.11	0.08	0.08	0.03	0.01	0.01	0.04
REAL FOREIGN BALANCE(1)	0.00	-0.01	-0.02	-0.04	-0.04	-0.04	-0.04	-0.03	-0.02	-0.02	-0.02
EXPORTS(G & S)	0.00	0.01	0.01	-0.01	-0.04	-0.07	-0.08	-0.09	-0.03	-0.07	-0.05
IMPORTS(G & S)	0.00	0.05	0.09	0.11	0.09	0.06	0.05	0.01	-0.01	-0.01	0.02
GDP/GNP(REAL)	0.00	0.05	0.09	0.09	0.07	0.04	0.03	-0.00	-0.02	-0.01	0.01
INDUSTRIAL PRODUCTION	0.01	0.06	0.10	0.11	0.09	0.05	0.05	0.01	-0.01	-0.00	0.03
TOTAL EMPLOYMENT	0.00	0.02	0.05	0.07	0.07	0.06	0.03	0.00	-0.03	-0.05	-0.05
UNEMPLOYMENT RATE(2)	0.00	-0.01	-0.04	-0.06	-0.06	-0.05	-0.03	-0.00	0.03	0.04	0.04
DEFLATORS:											
PRIVATE CONSUMPTION	0.01	0.05	0.10	0.16	0.19	0.19	0.18	0.14	0.12	0.10	0.10
TOTAL DOM. DEMAND	0.00	0.06	0.12	0.18	0.21	0.21	0.20	0.16	0.13	0.12	0.12
EXPORTS	0.00	0.02	0.06	0.11	0.13	0.14	0.14	0.13	0.11	0.09	0.09
IMPORTS	0.00	0.01	0.04	0.06	0.08	0.10	0.10	0.10	0.09	0.09	0.08
GDP/GNP	0.00	0.06	0.12	0.19	0.22	0.22	0.21	0.17	0.14	0.12	0.12
WAGE RATE	0.00	0.06	0.13	0.18	0.19	0.18	0.18	0.15	0.13	0.12	0.14
COMPENSATION/EMPLOYEE	0.00	0.06	0.12	0.17	0.17	0.16	0.17	0.14	0.12	0.12	0.13

(1)% OF BASELINE GDPV

(2)CHANGE IN % RATE

.. INDICATES NOT APPLICABLE

ENVIRONMENTAL INVESTMENTS AS % OF GDP (3)	0.03	0.03	0.03	0.03	0.03	0.03	0.00	0.00	0.00	0.00
ENVIRONMENTAL COSTS AS % OF GDP (3)	0.01	0.03	0.04	0.05	0.06	0.08	0.08	0.07	0.07	0.07

(3) in constant prices (market)

SIMTAB TABLE:

GERMANY — DIFFERENCES FROM BASELINE:WSP(3)-WSP(1)

VARIABLE	82	83	84	85	86	87	88	89	90	91	92
CURRENT BALANCE(BILL $)	-0.00	-0.06	-0.10	-0.13	-0.14	-0.20	-0.25	-0.21	-0.13	-0.19	-0.25
EXCHANGE RATE											
US $ RATE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EFFECTIVE RATE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
REL EXPORT PRICES-MANUF	0.00	0.01	0.03	0.06	0.07	0.06	0.05	0.04	0.03	0.02	0.01
MARKET GROWTH	0.00	0.02	0.03	0.03	0.03	0.01	0.00	-0.02	-0.03	-0.03	-0.02
OECD REAL GDP	0.00	0.01	0.01	0.02	0.02	0.01	0.01	0.01	0.00	0.00	0.00
REST OF OECD-REAL GDP	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00
OECD GDP DEFLATOR	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.07	0.07	0.07
NOMINAL GDP/GNP	0.00	0.11	0.21	0.29	0.29	0.26	0.24	0.17	0.12	0.11	0.13
MONEY SUPPLY	0.00	0.07	0.17	0.23	0.33	0.31	0.29	0.23	0.13	0.14	0.14
VELOCITY	0.00	0.04	0.04	0.01	-0.04	-0.06	-0.05	-0.07	-0.06	-0.03	-0.00
INTEREST RATES											
SHORT TERM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LONG TERM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
REAL LONG TERM	0.00	-0.02	-0.04	-0.06	-0.06	-0.03	-0.00	0.02	0.03	0.03	0.02
FINANCIAL BALANCES(3)											
GOVT.	0.00	0.02	0.04	0.05	0.07	0.07	0.06	0.05	0.04	0.03	0.03
BUSINESS	0.00	-0.03	-0.08	-0.11	-0.10	-0.09	-0.09	-0.06	-0.04	-0.04	-0.05
HOUSEHOLDS	0.00	0.01	0.02	0.03	0.01	0.00	-0.00	-0.01	-0.01	-0.00	0.00
FOREIGN	0.00	-0.01	-0.02	-0.03	-0.02	-0.02	-0.02	-0.02	-0.01	-0.01	-0.02
HOUSEHOLD SAVINGS RATIO	0.00	0.02	0.03	0.03	0.02	0.00	-0.00	-0.01	-0.02	-0.01	-0.00
DISCRETIONARY FISCAL POLICY CHANGES(3)	0.00	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01

(3)% OF BASELINE GDP

.. INDICATES NOT APPLICABLE

SIMTAB TABLE:

ITALY — DIFFERENCES FROM BASELINE:WSP(3)-WSP(1)

VARIABLE	82	83	84	[illegible]	86	87	88	89	90	91	92
PRIVATE CONSUMPTION	0.00	-0.01	-0.01	-0.[illegible]	-0.00	-0.01	-0.01	-0.01	0.00	0.00	-0.00
GOVT CONSUMPTION	0.00	0.00	0.00	0.[illegible]	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FIXED INVESTMENT:TOTAL	0.00	0.15	0.18	0.2[illegible]	0.20	0.18	0.16	0.03	0.01	-0.01	-0.02
GOVERNMENT	0.00	0.00	0.00	0.[illegible]	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL PRIVATE	0.00	0.20	0.23	0.2[illegible]	0.25	0.22	0.20	0.04	0.01	-0.01	-0.02
RESIDENTIAL	0.00	0.03	0.10	0.1[illegible]	0.09	-0.00	-0.07	-0.11	-0.14	-0.15	-0.12
BUSINESS	0.00	0.03	0.06	0.[illegible]	0.11	0.11	0.11	0.08	0.06	0.03	0.01
STOCKBUILDING(1)	0.00	-0.00	-0.00	-0.[illegible]	-0.01	-0.01	-0.01	-0.00	-0.00	0.00	0.00
TOTAL DOMESTIC DEMAND	0.00	0.02	0.03	0.[illegible]	0.04	0.04	0.04	0.03	0.02	0.02	0.02
REAL FOREIGN BALANCE(1)	0.00	-0.00	-0.01	-0.[illegible]	-0.01	-0.01	-0.01	-0.00	0.00	0.00	0.01
EXPORTS(G & S)	0.00	0.01	0.01	0.[illegible]	0.00	-0.01	-0.01	-0.02	-0.02	-0.01	0.00
IMPORTS(G & S)	0.00	0.03	0.05	0.[illegible]	0.05	0.04	0.03	-0.00	-0.02	-0.02	-0.02
GDP/GNP(REAL)	0.00	0.02	0.02	0.[illegible]	0.03	0.03	0.03	0.02	0.02	0.02	0.02
INDUSTRIAL PRODUCTION	0.00	0.02	0.03	0.[illegible]	0.04	0.04	0.04	0.03	0.03	0.03	0.02
TOTAL EMPLOYMENT	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.01	0.01
UNEMPLOYMENT RATE(2)	0.00	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.00	-0.00	-0.00	-0.01
DEFLATORS:											
PRIVATE CONSUMPTION	0.00	0.05	0.07	0.09	0.10	0.10	0.10	0.06	0.03	0.03	0.03
TOTAL DOM. DEMAND	0.00	0.05	0.08	0.09	0.10	0.10	0.09	0.06	0.03	0.03	0.03
EXPORTS	0.00	0.02	0.04	0.06	0.08	0.09	0.09	0.07	0.06	0.06	0.06
IMPORTS	0.00	0.01	0.03	0.05	0.03	0.09	0.09	0.08	0.03	0.07	0.07
GDP/GNP	0.00	0.05	0.08	0.10	0.10	0.10	0.10	0.06	0.03	0.02	0.03
WAGE RATE	0.00	0.04	0.08	0.10	0.12	0.12	0.12	0.09	0.06	0.06	0.06
COMPENSATION/EMPLOYEE	0.00	0.03	0.07	0.09	0.10	0.11	0.10	0.08	0.05	0.04	0.05

(1)% OF BASELINE GDPV

(2)CHANGE IN % RATE

.. INDICATES NOT APPLICABLE

ENVIRONMENTAL INVESTMENTS AS % OF GDP (3)	0.02	0.02	0.02	0.02	0.02	0.02	0.00	0.00	0.00	0.00
ENVIRONMENTAL COSTS AS % OF GDP (3)	0.01	0.01	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03

(3) in constant prices (market)

SIMTAB TABLE:

ITALY — DIFFERENCES FROM BASELINE:WSP(3)-WSP(1)

VARIABLE	82	83	84	85	86	87	88	89	90	91	92
CURRENT BALANCE(BILL $)	0.00	-0.01	-0.02	-0.04	-0.05	-0.07	-0.08	-0.05	-0.04	-0.03	-0.01
EXCHANGE RATE											
US $ RATE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EFFECTIVE RATE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
REL EXPORT PRICES-MANUF	0.00	0.01	0.01	0.02	0.02	0.01	0.01	-0.00	-0.01	-0.02	-0.01
MARKET GROWTH	0.00	0.02	0.04	0.04	0.04	0.02	0.01	-0.01	-0.03	-0.03	-0.02
OECD REAL GDP	0.00	0.01	0.01	0.02	0.02	0.01	0.01	0.01	0.00	0.00	0.00
REST OF OECD-REAL GDP	0.00	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.00	0.00	0.00
OECD GDP DEFLATOR	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.07	0.07	0.07
NOMINAL GDP/GNP	0.01	0.07	0.10	0.13	0.14	0.13	0.13	0.08	0.05	0.05	0.05
MONEY SUPPLY	0.01	0.05	0.09	0.12	0.14	0.15	0.15	0.11	0.09	0.08	0.08
VELOCITY	0.00	0.01	0.01	0.01	-0.00	-0.02	-0.03	-0.04	-0.03	-0.03	-0.03
INTEREST RATES											
SHORT TERM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LONG TERM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
REAL LONG TERM	0.00	-0.02	-0.03	-0.03	-0.02	-0.01	-0.00	0.02	0.03	0.03	0.01
FINANCIAL BALANCES(3)											
GOVT.	0.00	0.01	0.02	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.04
BUSINESS	0.00	-0.02	-0.03	-0.04	-0.05	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05
HOUSEHOLDS	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
FOREIGN	0.00	-0.00	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.00	-0.00	0.00
HOUSEHOLD SAVINGS RATIO	0.00	0.00	0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
DISCRETIONARY FISCAL POLICY CHANGES(3)	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00

(3)% OF BASELINE GDP

.. INDICATES NOT APPLICABLE

SUMMARY TABLE:

IRELAND — DIFFERENCES FROM BASELINE:WSP(3)-WSP(1)

VARIABLE	82	83	84	85	86	87	88	89	90	91	92
PRIVATE CONSUMPTION	0.00	0.01	0.01	0.01	0.00	-0.00	-0.01	-0.03	-0.04	-0.04	-0.04
GOVT CONSUMPTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FIXED INVESTMENT:TOTAL	0.00	0.09	0.11	0.12	0.13	0.13	0.12	0.00	-0.03	-0.05	-0.06
GOVERNMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL PRIVATE	0.00	0.09	0.11	0.12	0.13	0.13	0.12	0.00	-0.03	-0.05	-0.06
RESIDENTIAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BUSINESS	0.00	0.05	0.06	0.06	0.04	0.02	-0.01	-0.07	-0.10	-0.10	-0.09
STOCKBUILDING(1)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL DOMESTIC DEMAND	0.00	0.03	0.03	0.03	0.03	0.03	0.02	-0.01	-0.03	-0.04	-0.04
REAL FOREIGN BALANCE(1)	0.00	-0.01	-0.01	-0.01	-0.02	-0.02	-0.02	-0.01	-0.00	0.00	0.01
EXPORTS(G & S)	0.00	0.02	0.03	0.03	0.02	0.01	-0.01	-0.03	-0.05	-0.05	-0.04
IMPORTS(G & S)	0.00	0.03	0.04	0.05	0.04	0.03	0.02	-0.02	-0.05	-0.05	-0.05
GDP/GNP(REAL)	0.00	0.02	0.02	0.02	0.02	0.01	0.00	-0.02	-0.04	-0.04	-0.03
INDUSTRIAL PRODUCTION	0.00	0.02	0.02	0.02	0.02	0.01	-0.00	-0.03	-0.04	-0.04	-0.04
TOTAL EMPLOYMENT	0.00	0.00	0.01	0.01	0.01	0.01	0.00	-0.00	-0.01	-0.01	-0.01
UNEMPLOYMENT RATE(2)	0.00	-0.00	-0.01	-0.01	-0.01	-0.01	-0.00	0.00	0.01	0.01	0.01
DEFLATORS:											
PRIVATE CONSUMPTION	0.00	0.01	0.02	0.05	0.07	0.09	0.11	0.12	0.11	0.09	0.08
TOTAL DOM. DEMAND	0.00	0.01	0.02	0.04	0.07	0.09	0.11	0.11	0.11	0.09	0.08
EXPORTS	0.00	0.00	0.02	0.03	0.06	0.07	0.09	0.10	0.10	0.09	0.08
IMPORTS	0.00	0.00	0.02	0.04	0.06	0.08	0.10	0.10	0.10	0.09	0.08
GDP/GNP	0.00	0.01	0.02	0.04	0.07	0.09	0.10	0.11	0.10	0.09	0.08
WAGE RATE	0.00	0.01	0.02	0.04	0.07	0.09	0.11	0.11	0.10	0.08	0.07
COMPENSATION/EMPLOYEE	0.00	0.01	0.02	0.04	0.07	0.09	0.11	0.12	0.11	0.09	0.08

(1)% OF BASELINE GDPV

(2)CHANGE IN % RATE

.. INDICATES NOT APPLICABLE

ENVIRONMENTAL INVESTMENTS AS % OF GDP (3)	0.02	0.02	0.02	0.02	0.02	0.02	0.00	0.00	0.00	0.00
ENVIRONMENTAL COSTS AS % OF GDP (3)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

(3) in constant prices (market)

SIMTAB TABLE:

IRELAND — DIFFERENCES FROM BASELINE:WSP(3)-WSP(1)

VARIABLE	82	83	84	85	86	87	88	89	90	91	92
CURRENT BALANCE(BILL $)	0.00	-0.00	-0.00	-0.00	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
EXCHANGE RATE											
US $ RATE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EFFECTIVE RATE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
REL EXPORT PRICES-MANUF	0.00	-0.00	-0.00	-0.00	-0.00	0.01	0.01	0.02	0.02	0.01	0.01
MARKET GROWTH	0.00	0.03	0.05	0.05	0.04	0.02	0.01	-0.02	-0.04	-0.04	-0.03
OECD REAL GDP	0.00	0.01	0.01	0.02	0.02	0.01	0.01	0.01	0.00	0.00	0.00
REST OF OECD-REAL GDP	0.00	0.01	0.01	0.02	0.02	0.01	0.01	0.01	0.00	0.00	0.00
OECD GDP DEFLATOR	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.07	0.07	0.07
NOMINAL GDP/GNP	0.00	0.02	0.04	0.06	0.08	0.09	0.11	0.09	0.07	0.05	0.04
MONEY SUPPLY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VELOCITY	0.00	0.02	0.04	0.06	0.08	0.09	0.11	0.09	0.07	0.05	0.04
INTEREST RATES											
SHORT TERM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LONG TERM	0.00	0.00	0.00	0.00	-0.00	0.00	0.00	-0.00	-0.00	-0.00	-0.00
REAL LONG TERM	0.00	-0.00	-0.01	-0.02	-0.02	-0.02	-0.02	-0.01	0.00	0.01	0.02
FINANCIAL BALANCES(3)											
GOVT.	0.00	0.00	0.01	0.01	0.00	-0.00	-0.01	-0.01	-0.02	-0.03	-0.03
BUSINESS	0.00	-0.02	-0.02	-0.02	-0.02	-0.02	-0.01	0.01	0.02	0.03	0.04
HOUSEHOLDS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.00	-0.00	-0.00	-0.00
FOREIGN	0.00	-0.01	-0.01	-0.01	-0.02	-0.02	-0.02	-0.00	0.00	0.01	0.01
HOUSEHOLD SAVINGS RATIO	0.00	0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	0.00	0.00	0.00
DISCRETIONARY FISCAL POLICY CHANGES(3)	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01

(3)% OF BASELINE GDP

.. INDICATES NOT APPLICABLE

SIMTAB TABLE:

PORTUGAL — DIFFERENCES FROM BASELINE:WSP(3)-WSP(1)

VARIABLE	82	83	84	85	86	87	88	89	90	91	92
PRIVATE CONSUMPTION	0.00	0.02	0.03	0.03	0.03	0.02	0.02	-0.01	-0.02	-0.02	-0.03
GOVT CONSUMPTION	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FIXED INVESTMENT:TOTAL	0.00	0.25	0.33	0.36	0.32	0.28	0.25	-0.00	-0.02	-0.03	-0.03
GOVERNMENT	..	..	..	..	..	..	..	..	..	..	..
TOTAL PRIVATE	0.00	0.08	0.12	0.15	0.13	0.10	0.09	-0.00	-0.02	-0.03	-0.03
RESIDENTIAL	..	..	..	..	..	..	..	..	..	..	..
BUSINESS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STOCKBUILDING(1)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL DOMESTIC DEMAND	0.00	0.08	0.11	0.13	0.13	0.13	0.12	0.06	0.04	0.03	0.03
REAL FOREIGN BALANCE(1)	0.00	-0.03	-0.03	-0.03	-0.04	-0.04	-0.04	-0.02	-0.02	-0.02	-0.02
EXPORTS(G & S)	0.00	0.02	0.03	0.03	0.01	-0.01	-0.02	-0.05	-0.06	-0.06	-0.05
IMPORTS(G & S)	0.00	0.10	0.13	0.13	0.12	0.11	0.09	0.02	-0.01	-0.01	-0.01
GDP/GNP(REAL)	0.00	0.06	0.07	0.09	0.09	0.09	0.08	0.03	0.02	0.01	0.01
INDUSTRIAL PRODUCTION	0.00	0.07	0.09	0.10	0.10	0.10	0.10	0.04	0.02	0.02	0.01
TOTAL EMPLOYMENT	0.00	0.01	0.03	0.04	0.04	0.04	0.04	0.02	0.01	0.01	0.00
UNEMPLOYMENT RATE(2)	0.00	-0.01	-0.03	-0.03	-0.03	-0.03	-0.03	-0.02	-0.01	-0.01	-0.00
DEFLATORS:											
PRIVATE CONSUMPTION	0.00	0.02	0.04	0.07	0.09	0.11	0.13	0.13	0.12	0.12	0.13
TOTAL DOM. DEMAND	0.00	0.01	0.03	0.06	0.08	0.10	0.11	0.11	0.11	0.11	0.12
EXPORTS	0.00	0.01	0.03	0.05	0.08	0.09	0.11	0.12	0.11	0.11	0.11
IMPORTS	0.00	0.00	0.02	0.04	0.07	0.08	0.09	0.10	0.09	0.09	0.09
GDP/GNP	0.00	0.01	0.03	0.06	0.08	0.10	0.12	0.12	0.12	0.12	0.12
WAGE RATE	0.00	0.01	0.03	0.06	0.08	0.10	0.11	0.12	0.11	0.11	0.11
COMPENSATION/EMPLOYEE	0.00	0.03	0.06	0.09	0.12	0.14	0.16	0.16	0.15	0.15	0.16

(1)% OF BASELINE GDPV

(2)CHANGE IN % RATE

.. INDICATES NOT APPLICABLE

ENVIRONMENTAL INVESTMENTS AS % OF GDP (3)	0.04	0.04	0.04	0.04	0.04	0.04	0.00	0.00	0.00	0.00
ENVIRONMENTAL COSTS AS % OF GDP (3)	0.01	0.02	0.03	0.04	0.05	0.06	0.06	0.06	0.05	0.05

(3) in constant prices (market)

SIMTAB TABLE:

PORTUGAL — DIFFERENCES FROM BASELINE:WSP(3)-WSP(1)

VARIABLE	82	83	84	85	86	87	88	89	90	91	92
CURRENT BALANCE(BILL $)	0.00	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02
EXCHANGE RATE											
US $ RATE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EFFECTIVE RATE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
REL EXPORT PRICES-MANUF	0.00	-0.00	0.00	0.01	0.01	0.02	0.02	0.03	0.03	0.03	0.03
MARKET GROWTH	0.00	0.03	0.05	0.05	0.04	0.02	0.01	-0.02	-0.04	-0.04	-0.02
OECD REAL GDP	0.00	0.01	0.01	0.02	0.02	0.01	0.01	0.01	0.00	0.00	0.00
REST OF OECD-REAL GDP	0.00	0.01	0.01	0.02	0.02	0.01	0.01	0.01	0.00	0.00	0.00
OECD GDP DEFLATOR	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.07	0.07	0.07
NOMINAL GDP/GNP	0.00	0.07	0.11	0.15	0.17	0.19	0.20	0.16	0.14	0.13	0.13
MONEY SUPPLY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VELOCITY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INTEREST RATES											
SHORT TERM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LONG TERM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
REAL LONG TERM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FINANCIAL BALANCES(3)											
GOVT.	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.01	-0.00	-0.01	-0.01
BUSINESS	0.00	-0.06	-0.08	-0.08	-0.08	-0.09	-0.09	-0.05	-0.04	-0.04	-0.04
HOUSEHOLDS	0.00	0.01	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03
FOREIGN	0.00	-0.04	-0.05	-0.04	-0.04	-0.04	-0.04	-0.02	-0.02	-0.02	-0.02
HOUSEHOLD SAVINGS RATE	0.00	0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	0.00	0.00
DISCRETIONARY FISCAL POLICY CHANGES(3)	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01

(3)% OF BASELINE GDP

.. INDICATES NOT APPLICABLE

3.4. Coordinated versus isolated action

Effects of reducing SO_2 emissions
Percentage changes from baseline levels

	GER		UKM		ITA		NET		BLX	
	IA	CA	IA	CA	IA	CA	IA	CA	IA	CA
Gross domestic product										
1988-1993	0.09	0.13	0.04	0.06	0.06	0.08	0.06	0.12	0.03	0.12
1994-1997	-0.04	-0.06	-0.03	-0.05	0.05	0.03	-0.04	-0.08	-0.03	-0.03
Private consumption										
1988-1993	-0.01	-0.01	-0.03	-0.03	-0.01	-0.03	+0.00	0.01	0.00	0.02
1994-1997	-0.02	-0.06	-0.08	-0.11	0.02	-0.02	-0.02	-0.03	-0.04	-0.08
Total fixed investment[3])										
1988-1993	0.65	0.71	0.66	0.70	0.66	0.70	0.39	0.47	0.27	0.45
1994-1997	-0.17	-0.21	-0.09	-0.06	-0.03	-0.00	-0.07	-0.14	-0.05	-0.06
Current balance[1])										
1988-1993	-0.36	-0.21	-0.29	-0.22	-0.23	-0.18	-0.08	-0.03	-0.04	0.02
1994-1997	-0.26	-0.06	-0.18	-0.13	-0.09	-0.08	-0.11	-0.09	-0.06	0.03
Employment										
1988-1993	0.09	0.13	0.02	0.03	0.02	0.02	0.04	0.09	0.02	0.06
1994-1997	-0.11	-0.11	-0.04	-0.05	0.01	0.01	-0.01	-0.04	0.01	0.01
Consumer prices										
1988-1993	0.29	0.34	0.35	0.43	0.25	0.34	0.10	0.21	0.04	0.15
1994-1997	0.12	0.24	0.04	0.20	-0.04	0.10	0.21	0.48	0.08	0.33
Government financial bal.[2])										
1988-1993	0.10	0.13	0.07	0.08	0.08	0.10	0.05	0.09	0.02	0.06
1994-1997	0.03	0.06	0.08	0.10	0.11	0.12	0.00	0.01	-0.00	0.04

IA = isolated action
CA = coordinated action
1) billion $
2) % of baseline gross domestic product
3) total fixed investment including environmental investment

For remaining countries, see next page

Effects of reducing SO_2 emissions
Percentage changes from baseline levels

	DEN		IRE		SPA		GRE	
	IA	CA	IA	CA	IA	CA	IA	CA
Gross domestic product								
1988-1993	0.14	0.17	0.10	0.12	0.05	0.09	0.03	0.06
1994-1997	0.01	+0.00	-0.03	-0.21	0.01	0.03	0.02	0.05
Private consumption								
1988-1993	0.01	0.01	+0.00	0.00	0.01	0.03	0.01	0.01
1994-1997	-0.10	-0.15	-0.14	-0.29	-0.01	-0.02	0.01	+0.00
Fixed investment[3]								
1988-1993	0.82	0.89	0.67	0.88	0.20	0.24	0.11	0.16
1994-1997	-0.08	-0.10	-0.10	-0.35	-0.01	-0.01	0.02	0.04
Current balance[1]								
1988-1993	-0.07	-0.06	-0.04	-0.05	-0.05	0.00	-0.00	0.00
1994-1997	-0.04	-0.03	-0.06	-0.09	-0.05	0.02	-0.01	0.00
Employment								
1988-1993	0.05	0.05	0.05	0.05	0.03	0.05	0.01	0.03
1994-1997	0.05	0.04	0.05	-0.03	0.02	0.02	0.01	0.02
Consumer prices								
1988-1993	0.13	0.20	0.12	0.45	0.05	0.14	0.02	0.07
1994-1997	0.19	0.36	0.13	0.56	0.03	0.19	0.02	0.13
Government financial bal.[2]								
1988-1993	0.09	0.10	0.03	0.01	0.02	0.03	0.01	0.01
1994-1997	0.05	0.06	-0.04	-0.16	0.01	0.01	+0.00	0.00

IA = isolated action
CA = coordinated action
1) billion $
2) % of baseline gross domestic product
3) including environmental investment

Effects of reducing NO_x emissions
Percentage changes from baseline levels

	GER		UKM		ITA		NET		BLX	
	IA	CA	IA	CA	IA	CA	IA	CA	IA	CA
Gross domestic product										
1988-1993	0.06	0.06	0.00	0.01	0.02	0.03	0.01	0.03	0.00	0.03
1994-1997	0.00	0.00	-0.01	-0.01	0.03	0.02	-0.01	-0.01	0.00	0.00
Private consumption										
1988-1993	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00
1994-1997	0.00	-0.02	-0.01	-0.02	0.01	0.00	0.00	-0.01	0.00	-0.02
Fixed investment[3])										
1988-1993	0.27	0.27	0.06	0.07	0.17	0.18	0.05	0.07	0.03	0.08
1994-1997	-0.03	-0.05	-0.02	0.00	-0.00	0.00	-0.01	-0.02	-0.01	-0.00
Current balance[1])										
1988-1993	-0.17	-0.15	-0.02	0.00	-0.06	-0.05	-0.01	0.01	-0.01	0.01
1994-1997	-0.21	-0.21	-0.01	0.02	-0.04	-0.03	-0.01	0.00	-0.01	0.02
Employment										
1988-1993	0.04	0.05	0.00	0.01	0.01	0.01	0.00	0.02	0.00	0.01
1994-1997	-0.03	-0.03	-0.01	-0.01	0.01	0.01	-0.01	-0.01	0.00	0.00
Consumer prices										
1988-1993	0.14	0.15	0.03	0.06	0.06	0.09	0.01	0.04	0.00	0.03
1994-1997	0.10	0.12	-0.01	0.06	-0.09	0.04	0.01	0.10	0.01	0.08
Government financial bal.[2])										
1988-1993	0.05	0.06	0.01	0.01	0.03	0.03	0.00	0.02	0.00	0.01
1994-1997	0.04	0.04	0.01	0.01	0.04	0.04	-0.01	0.00	0.00	0.01

IA = isolated action
CA = coordinated action
[1]) billion $
[2]) % of baseline gross domestic product
[3]) including environmental investment

For remaining countries, see next page

Effects of reducing NO_x emissions
Percentage changes from baseline levels

	DEN		IRE		SPA		POR	
	IA	CA	IA	CA	IA	CA	IA	CA
Gross domestic product								
1988-1993	0.01	0.02	0.01	0.02	0.00	0.02	0.08	0.08
1994-1997	-0.01	-0.01	-0.01	-0.03	0.00	0.01	0.03	0.02
Private consumption								
1988-1993	0.00	0.00	-0.00	0.00	0.00	0.01	0.04	0.03
1994-1997	-0.01	-0.03	-0.02	-0.04	0.00	0.00	0.01	-0.02
Fixed investment[3])								
1988-1993	0.10	0.13	0.08	0.12	0.02	0.03	0.29	0.30
1994-1997	-0.03	-0.02	-0.02	-0.04	0.00	0.00	-0.01	-0.02
Current balance[1])								
1988-1993	-0.01	-0.01	0.00	-0.01	-0.01	0.01	-0.02	-0.01
1994-1997	0.00	0.00	-0.01	-0.01	-0.01	0.02	-0.02	-0.02
Employment								
1988-1993	0.00	0.00	0.00	0.01	0.00	0.01	0.03	0.03
1994-1997	0.00	0.00	0.00	-0.01	0.00	0.00	0.01	0.01
Consumer prices								
1988-1993	0.01	0.03	0.01	0.06	0.00	0.03	0.05	0.08
1994-1997	0.01	0.06	0.01	0.10	0.00	0.05	0.06	0.13
Government financial bal.[2])								
1988-1993	0.01	0.01	0.00	0.00	0.00	0.00	0.02	0.02
1994-1997	0.00	0.00	-0.01	-0.02	0.00	0.00	0.00	0.00

IA = isolated action
CA = coordinated action
[1]) billion $
[2]) % of baseline gross domestic product
[3]) including environmental investment

Effects of reducing SO_2 and NO_X emissions
Percentage changes from baseline levels

	GER		UKM		ITA		NET		BLX	
	IA	CA	IA	CA	IA	CA	IA	CA	IA	CA
Gross domestic product										
1988-1993	0.15	0.19	0.05	0.07	0.09	0.11	0.06	0.15	0.03	0.15
1994-1997	-0.04	-0.06	-0.03	-0.06	0.07	0.05	-0.05	-0.10	-0.03	-0.03
Private consumption										
1988-1993	-0.01	-0.01	-0.03	-0.03	-0.02	-0.03	+0.00	0.01	0.00	0.02
1994-1997	-0.03	-0.07	-0.09	-0.14	0.03	-0.02	-0.02	-0.03	-0.04	-0.09
Fixed investment[3])										
1988-1993	0.92	0.98	0.72	0.77	0.83	0.87	0.44	0.55	0.30	0.52
1994-1997	-0.20	-0.26	-0.10	-0.05	-0.04	+0.00	-0.08	-0.17	-0.05	-0.07
Current balance[1])										
1988-1993	-0.52	-0.36	-0.32	-0.22	-0.29	-0.22	-0.09	-0.02	-0.05	0.02
1994-1997	-0.46	-0.27	-0.19	-0.11	-0.13	-0.12	-0.12	-0.09	-0.06	0.05
Employment										
1988-1993	0.14	0.18	0.02	0.04	0.02	0.03	0.05	0.10	0.02	0.07
1994-1997	-0.14	-0.14	-0.04	-0.07	0.01	0.01	-0.02	-0.06	0.01	0.01
Consumer prices										
1988-1993	0.43	0.49	0.38	0.48	0.31	0.42	0.11	0.24	0.04	0.18
1994-1997	0.22	0.36	0.03	0.27	-0.05	0.14	0.22	0.58	0.08	0.40
Government financial bal.[2])										
1988-1993	0.16	0.19	0.07	0.09	0.11	0.13	0.05	0.10	0.02	0.08
1994-1997	0.07	0.09	0.08	0.10	0.14	0.16	0.00	0.01	-0.00	0.05

IA = isolated action
CA = coordinated action
[1]) billion $
[2]) % of baseline gross domestic product
[3]) including environmental investment

For remaining countries, see next page

Effects of reducing SO_2 and NO_X emissions
Percentage changes from baseline levels

	DEN		IRE		SPA		GRE		POR	
	IA	CA	IA	CA	IA	CA	IA[4])	CA	IA[5])	CA
Gross domestic product										
1988-1993	0.16	0.19	0.10	0.13	0.05	0.10	0.03	0.07	0.08	0.12
1994-1997	0.01	-0.01	-0.04	-0.24	0.01	0.04	0.02	0.07	0.03	0.00
Private consumption								[4])		[5])
1988-1993	0.01	0.00	0.00	0.00	0.02	0.04	0.01	0.01	0.04	0.03
1994-1997	-0.11	-0.18	-0.16	-0.33	-0.01	-0.02	0.01	+0.00	0.01	-0.02
Fixed investment[3])										
1988-1993	0.93	1.02	0.75	0.99	0.22	0.27	0.11	0.18	0.49	0.36
1994-1997	-0.10	-0.12	-0.13	-0.38	-0.01	-0.01	0.02	0.05	-0.02	-0.07
Current balance[1])										
1988-1993	-0.07	-0.07	-0.04	-0.06	-0.06	0.01	-0.00	-0.00	-0.02	-0.02
1994-1997	-0.05	-0.03	-0.07	-0.09	-0.06	0.04	-0.01	0.00	-0.02	-0.04
Employment										
1988-1993	0.05	0.05	0.06	0.06	0.03	0.05	0.01	0.03	0.03	0.06
1994-1997	0.05	0.04	0.05	-0.05	0.02	0.02	0.01	0.03	0.01	0.00
Consumer prices										
1988-1993	0.14	0.23	0.13	0.51	0.05	0.17	0.02	0.09	0.05	0.18
1994-1997	0.20	0.42	0.14	0.66	0.03	0.24	0.02	0.16	0.06	0.31
Government financial bal.[2])								[4])		[5])
1988-1993	0.10	0.12	0.03	0.01	0.02	0.03	0.01	0.01	0.02	0.02
1994-1997	0.05	0.07	-0.05	-0.18	0.01	0.01	+0.00	0.00	0.00	-0.00

IA = isolated action
CA = coordinated action
1) billion $
2) % of baseline gross domestic product
3) including environmental investment
4) only the impact of SO_2 emissions
5) only the impact of NO_X emissions

3.5. The impact of non accomodating monetary policy

Effects of reducing SO_2 and NO_x emissions
Percentage changes from baseline levels

	GER		UKM		ITA		NET		BLX	
	IA	CA	IA	CA	IA	CA	IA	CA	IA	CA
Gross domestic product										
1988-1993	-0.01	-0.01	-0.01	-0.04	0.03	0.02	0.06	0.08	0.03	0.06
1994-1997	-0.05	-0.10	-0.04	-0.11	0.01	-0.04	-0.05	-0.10	-0.03	-0.09
Private consumption										
1988-1993	-0.13	-0.15	-0.12	-0.13	-0.03	-0.06	0.00	-0.03	0.00	-0.02
1994-1997	-0.02	-0.05	-0.05	-0.14	0.02	-0.04	-0.03	-0.08	-0.04	-0.10
Fixed investment[3]										
1988-1993	0.51	0.49	0.13	0.06	0.48	0.45	0.44	0.43	0.29	0.18
1994-1997	-0.21	-0.27	-0.50	-0.79	-0.41	-0.33	-0.08	-0.16	-0.06	-0.39
Current balance[1]										
1988-1993	-0.03	0.04	-0.04	0.28	-0.17	-0.14	-0.09	-0.05	-0.05	-0.01
1994-1997	-0.83	-1.08	0.26	0.76	0.06	0.05	-0.12	-0.11	-0.06	0.02
Employment										
1988-1993	-0.19	-0.20	-0.02	-0.02	0.02	0.02	0.05	0.06	0.02	0.03
1994-1997	-0.40	-0.46	0.01	-0.03	0.01	0.01	-0.02	-0.06	+0.00	-0.03
Consumer prices										
1988-1993	0.43	0.47	0.20	0.26	0.31	0.39	0.11	0.20	0.04	0.14
1994-1997	0.35	0.43	0.05	0.18	0.00	0.14	0.22	0.43	0.08	0.29
Government financial bal.[2]										
1988-1993	-0.07	-0.08	-0.07	-0.06	-0.07	-0.09	0.05	0.06	0.02	0.03
1994-1997	-0.22	-0.26	-0.12	-0.16	-0.09	-0.17	0.00	-0.02	-0.00	-0.01
Short-term interest rates[3]										
1988-1993	0.43	0.46	0.26	0.34	0.12	0.15	0.01	0.22	+0.00	0.22
1994-1997	-0.00	-0.02	0.02	0.09	-0.02	-0.00	+0.00	0.10	0.00	0.05
Long-term interest rates[3]										
1988-1993	0.23	0.26	0.17	0.21	0.10	0.12	0.01	0.10	0.00	0.11
1994-1997	0.16	0.17	0.08	0.16	0.01	0.03	+0.00	0.13	0.00	0.12

IA = isolated action
CA = coordinated action
1) billion $
2) % of baseline gross domestic product
3) as percentage point

For remaining countries, see next page

Effects of reducing SO_2 and NO_x emissions
Percentage changes from baseline levels

	DEN		IRE		SPA		GRE		POR	
	IA	CA	IA	CA	IA	CA	IA	CA	IA	CA
Gross domestic product										
1988-1993	0.16	0.14	0.10	0.06	0.05	0.07	0.03	0.05	0.08	0.08
1994-1997	+0.00	-0.04	-0.04	-0.15	0.01	0.01	0.02	0.02	0.03	-0.02
Private consumption										
1988-1993	0.01	-0.02	0.00	-0.01	0.02	0.02	0.01	-0.00	0.04	0.01
1994-1997	-0.11	-0.18	-0.16	-0.27	-0.01	-0.04	0.01	-0.02	0.01	-0.08
Fixed investment[3]										
1988-1993	0.92	0.78	0.75	0.58	0.22	0.23	0.11	0.13	0.29	0.30
1994-1997	-0.11	-0.32	-0.13	-0.58	-0.01	-0.03	0.02	0.01	-0.01	-0.07
Current balance[1]										
1988-1993	-0.07	-0.08	-0.04	-0.05	-0.06	-0.02	-0.00	-0.01	-0.02	-0.02
1994-1997	-0.05	-0.06	-0.07	-0.07	-0.06	-0.04	-0.01	-0.02	-0.02	-0.03
Employment										
1988-1993	0.05	0.06	0.06	0.04	0.03	0.04	0.01	0.02	0.03	0.03
1994-1997	0.05	0.03	0.05	-0.01	0.02	0.01	0.01	0.01	0.01	-0.01
Consumer prices										
1988-1993	0.14	0.19	0.13	0.33	0.05	0.13	0.02	0.07	0.05	0.14
1994-1997	0.20	0.33	0.14	0.35	0.03	0.16	0.02	0.11	0.06	0.22
Government financial bal.[2]										
1988-1993	0.10	0.08	0.03	-0.01	0.02	0.02	0.01	+0.00	0.02	0.01
1994-1997	0.05	0.02	-0.05	-0.13	0.01	+0.00	+0.00	-0.01	0.00	-0.03
Short-term interest rates[3]										
1988-1993	0.00	0.18	0.00	0.18	0.00	0.13	0.00	0.00	0.00	0.00
1994-1997	0.00	0.05	0.00	0.07	0.00	0.05	0.00	0.00	0.00	0.00
Long-term interest rates[3]										
1988-1993	0.00	0.10	0.00	0.10	0.00	0.08	0.00	0.00	0.00	0.00
1994-1997	0.00	0.09	0.00	0.10	0.00	0.08	0.00	0.00	0.00	0.00

IA = isolated action
CA = coordinated action
1) billion $
2) % of baseline gross domestic product
3) as percentage point

4. INPUT FOR INTERLINK

4.1. Introduction

This section presents the inputdata for INTERLINK as calculated outside the model. It should be noted that:
For the large country models capital costs (interest and depreciation) are calculated within INTERLINK.
For all country models the total annual wage sum is calculated within INTERLINK using the figures on permanent direct employment in the following tables and the country specific wage sum per employee in INTERLINK.
Data presented in the following tables are in constant prices of 1985. Investments are presented for the whole period (1983-1988) and it is assumed that in each year 1/6 of the investment take place. Annual costs are presented at the end of the period (1988). In constant prices these costs gradually increase (1/6 first year, 2/6 second year, 3/6 third year etc.) and remain constant after 1988.
Costs and investments, as percentage of the gross domestic product, are included in section 3 (detailed results) in order to facilitate the explanation of country differences. And of course the input for SO_2 and NO_X is simply the sum of both SO_2 and NO_X control.

4.2. SO_2

FINAL OECD INPUT DEUTSCHMARK, NO VAT

Emission: SO_2 Year: 1995 Scenario: UNIPEDE
Abatement strategy: 45% CEC

Costs in million DM of 1985 Excluding VAT							Other Data
Country	Investments	Operating costs			Capital costs (annuities)	Total Annual Costs[1]	Employment (men years) (1988)
		Materials	Energy	Wages[1]			
B	464	37.1	7.9		43.5		40
DK	851	68.6	61.2		59.6		55
F	0	0.0	0.0		0.0		0
FRG	9.314	758.2	329.6		[2]		648
GR	61	19.6	0.0		1.7		0
IRE	327	26.8	12.9		37.8		25
I	4.528	362.0	119.9		[2]		287
L	0	0.0	0.0		0.0		0
NL	1.237	100.1	50.8		101.3		83
P	0	0.0	0.0		0.0		0
SP	976	79.2	33.3		69.6		50
UK	6.172	500.4	157.9		[2]		207

[1]) calculated within the model
[2]) are calculated within the model for the large countries
[3]) costs are calculated for the end of the investmentperiod so cumulative

FINAL OECD INPUT NATIONAL CURRENCIES, NO VAT

Costs of 45% SO_2 reduction in national currencies excluding VAT (at factorcosts!)
Average exchange rate of 1985 OECD "Economic indicators"

Date:							Exchange rate (1985) (nat. currency per DM)
Country	Investments	Operating costs			Capital costs (annuities)	Annual[1] Costs	
		Materials	Energy	Wages[1]			
B	9.369	749.2	159.5		878.4		20.19
DK	3.064	246.9	220.3		214.4		3.6
F	0	0.0	0.0		0.0		0
FRG	9.314	758.2	329.6		[2]		1
GR	2.838	917.2	0.0		78.2		46.89
IRE	105	8.6	4.1		12.1		0.321
I	2.936.001	234.692.4	77.743.2		[1]		648.4
L	0	0.0	0.0		0.0		0
NL	1.395	112.9	57.3		114.3		1.128
P	0	0.0	0.0		0.0		57.72
SP	56.392	4.575.2	1.923.4		4.017.9		57.76
UK	1.636	132.6	41.8		[1]		0.265

[1]) calculated within the model

[2]) calculated within the model for the large countries

4.3. NO_x

OECD INPUT NO VAT, DEUTSCHMARKS

Emission: NO_x Year: 1995 Scenario: UNIPEDE
Abatement strategy: 30% CEC (Constant share large plants)

Costs in million DM of 1985 Excluding VAT							Other Data
Country	Investments	Operating costs			Capital costs (annuities)	Total Annual Costs	Employment (men years)
		Materials	Energy	Wages			
B	50	0.0	0.0	0.0	4.6	4.6	0
DK	127	0.0	0.0	0.0	12.7	12.7	0
F	0	0.0	0.0	0.0	0.0	0.0	0
FRG	3.164	628.2	407.1	0.0	[1]	[1]	0
GR	0	0.0	0.0	0.0	0.0	0.0	0
IRE	44	0.0	0.0	0.0	5.4	5.4	0
I	1.127	247.4	30.9	0.0	[1]	[1]	0
L	0	0.0	0.0	0.0	0.0	0.0	0
NL	162	0.0	0.0	0.0	13.7	13.7	0
P	131	26.2	4.8	0.0	14.2	45.2	0
SP	99	0.0	0.0	0.0	8.2	8.2	0
UK	565	0.0	0.0	0.0	[1]	[1]	0

[1]) calculated within the model

OECD INPUT NO VAT, NATIONAL CURRENDIES NO_x

Costs of 30% NO_x reduction in national currencies excl. VAT (at factorcosts!)
Average exchange rate of 1985 OECD "Economic indicators"

Date:							
Country	Investments	Operating costs			Capital costs (annuities)	Annual Costs	Exchange rate (1985) (nat. currency per DM)
		Materials	Energy	Wages[1])			
B	1.010	0.0	0.0	0.0	93.9	93.9	20.19
DK	458	0.0	0.0	0.0	45.8	45.8	3.6
F	0	0.0	0.0	0.0	0.0	0.0	0
FRG	3.164	628.2	407.1	0.0			1
GR	0	0.0	0.0	0.0	0.0	0.0	46.89
IRE	14	0.0	0.0	0.0	1.7	1.7	0.321
I	730.872	160.393.7	20.035.6	0.0			648.4
L	0	0.0	0.0	0.0	0.0	0.0	0
NL	183	0.0	0.0	0.0	15.4	15.4	1.128
P	7.544	1.513.9	277.1	0.0	820.2	2.611.2	57.72
SP	5.725	0.0	0.0	0.0	476.3	476.3	57.76
UK	150	0.0	0.0	0.0			0.265

[1]) calculated within the model