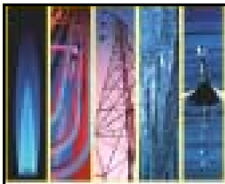
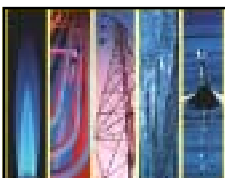


POLICIES AND MEASURES TO REDUCE GHG EMISSIONS AND INCREASE ENERGY EFFICIENCY IN GERMANY

by

Prof. Dr. Rolf-Ulrich Sprenger
College of Europe, Bruges/Belgium and
IFO Institute for Economic Research, Munich/Germany

February 2005



STRUCTURE OF THE PRESENTATION

(1) WHAT ARE THE MAJOR DRIVERS OF ENERGY USE AND GHG EMISSIONS IN GERMANY?

(2) WHAT ARE THE MAJOR TRENDS?

(3) WHICH TARGETS HAVE BEEN SET WITH RESPECT TO
- GHG EMISSIONS
- RENEWABLE ENERGIES
- ENERGY EFFICIENCY?

(4) WHAT ARE THE POLICIES AND MEASURES TO ACHIEVE THESE TARGETS?

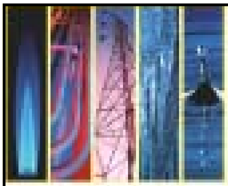
(5) WHAT IS THE ACTUAL PROGRESS?

(6) WHAT ARE THE EFFECTS OF THE POLICIES AND MEASURES?

(7) WHAT IS THE CONTRIBUTION OF OTHER DETERMINANTS?

(8) WHAT ARE THE LESSONS TO BE LEARNED?

(1) WHAT ARE THE MAJOR DRIVERS OF ENERGY USE AND GHG EMISSIONS IN GERMANY?

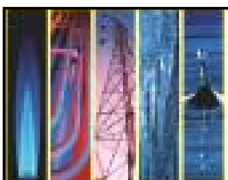


KEY INDICATORS REFERRING TO PRIMARY ENERGY CONSUMPTION (PEC) AND CO_2 EMISSIONS IN GERMANY

1990, 1995, and 2003

	1990	1995	2003	CHANGES IN P.C.	
				1990/1995	1995/2003
POPULATION (YEARLY AVERAGE) MN. PERSONS	79.4	81.7	82.7	0.6	0.2
GDP (€ BN, PRICES OF 1995)	1,671	1,801	1,988	1,5	1,2
GDP PER CAPITA (€ 1,000)	21.1	22.1	24.0	0.9	1.1
PEC (PETAJOULE)	15,271	14,332	14,466	-1.3	0.1
PEC PER CAPITA (GIGAJOULE)	192	176	175	-1.8	0.0
CO_2 EMISSIONS PER CAPITA (TONS)	12.8	10.7	10.2	-3.4	-0.6
NATIONAL CO_2 INTENSITY (TONS CO_2/€ MN. GDP)	606	487	425	-4.3	-1.7
NATIONAL ENERGY INTENSITY (TJ/€ BN GDP)	9,140	7,957	7,278	-2.7	-1.7

Source: DIW.



THE GERMAN PRIMARY ENERGY CONSUMPTION AND NET ELECTRICITY PRODUCTION IN 2002

ENERGY CARRIER	PRIMARY ENERGY CONSUMPTION[1]		NET ELECTRICITY PRODUCTION[2]	
	PJ	%	TWh	%
MINERAL OILS	5,370.0	37.5	20[4]	2
NATURAL GAS	3,107.5	21.7	36	7
HARD COAL	1,890.2	13.2	114	22
LIGNITE	1,661.1	11.6	143	29
NUCLEAR ENERGY	1,804.3	12.6	156	31
RENEWABLE ENERGY SOURCES	415.3	2.9	45	9
OTHERS	71.6	0.5[3]	-	-
TOTAL	14,320.0	100	504	100

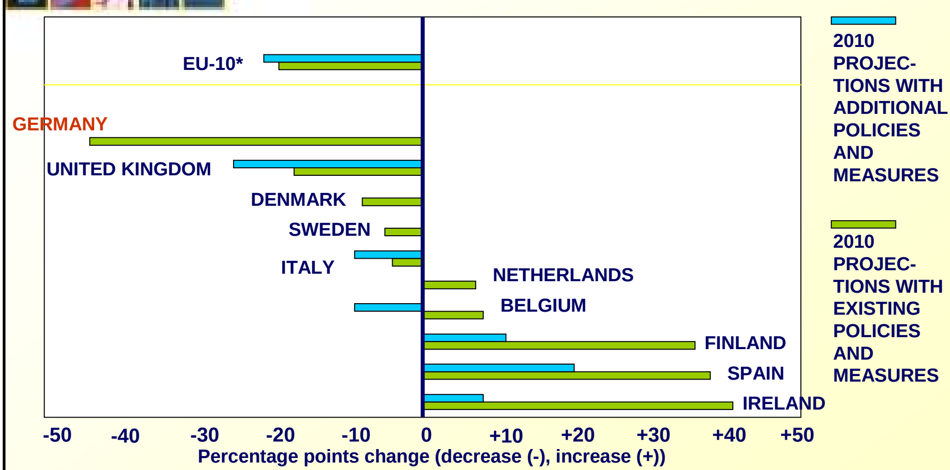
Notes: 1. Preliminary data for primary energy consumption.- 2. Net electricity production = gross electricity production – own use of power planTs.- 3. Balance of foreign trade account.- 4. Fuel oil and others.-

Source: BMU, 2003, p. 14; VDEW, 2003, p. 28.

(2) WHAT ARE THE MAJOR TRENDS?

GREENHOUSE GAS EMISSION PROJECTIONS FROM ENERGY SUPPLY AND USE, EXCLUDING TRANSPORT

(CHANGES FROM 1990 TO 2010)

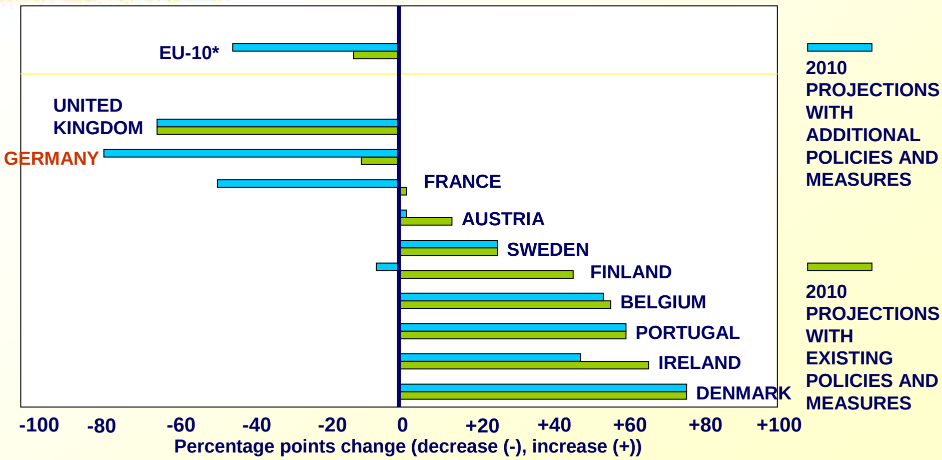


Note: EU-10 emissions and projections are given only for those MS that report projections (B, D, DK, E, FIN, IRL, I, NL, S, UK)

Source: **EEA.**

GREENHOUSE GAS EMISSION PROJECTIONS FROM NON-ENERGY-RELATED INDUSTRIAL PROCESSES

(CHANGES FROM 1990 TO 2010)

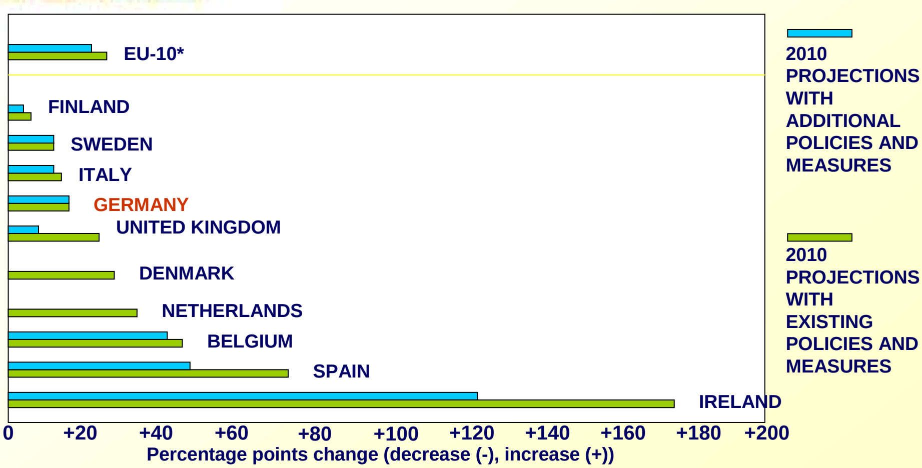


Note: EU-10 emissions and projections are given only for those MS that report projections (B, D, DK, E, FIN, NL, IRL, P, S, UK)

Source: EEA.

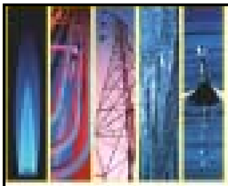
GREENHOUSE GAS EMISSION PROJECTIONS FROM TRANSPORT

(CHANGES FROM 1990 TO 2010)



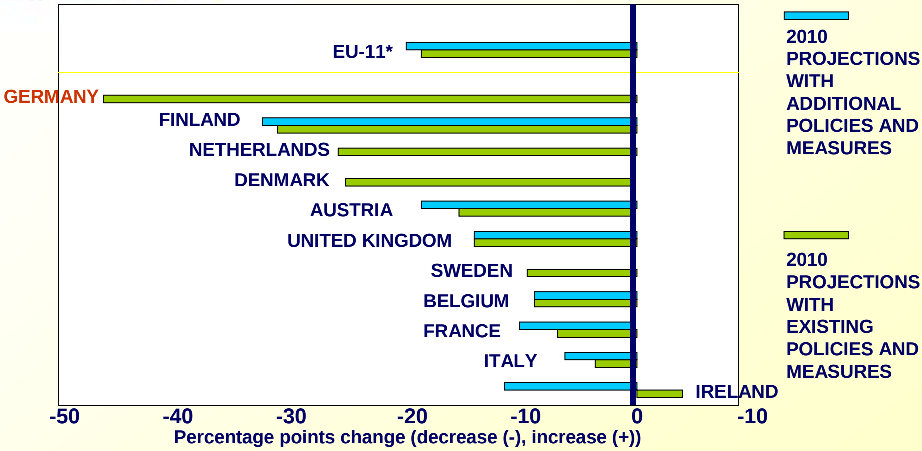
Note: EU-10 emissions and projections are given only for those MS that report projections (B, D, DK, E, FIN, IRL, I, NL, S, UK)

Source: EEA.



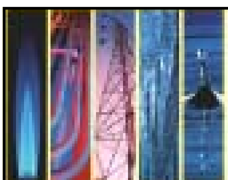
GREENHOUSE GAS EMISSION PROJECTIONS FROM AGRICULTURE

(CHANGES FROM 1990 TO 2010)



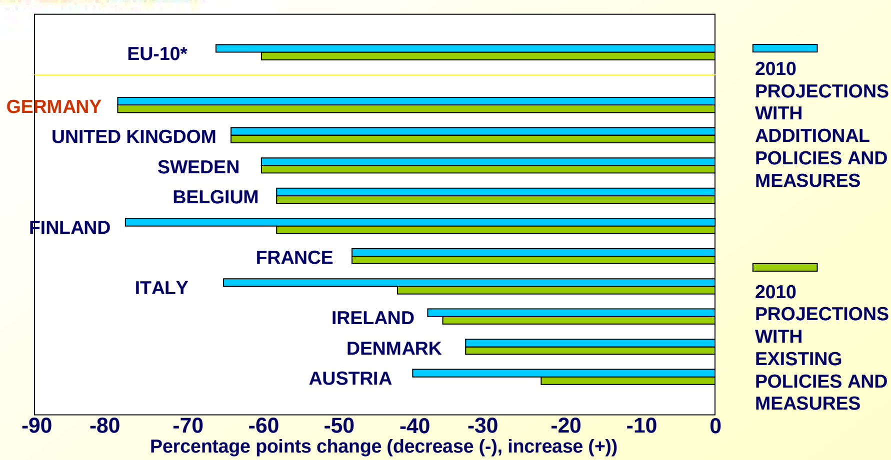
Note: EU-11 emissions and projections are given only for those MS that report projections (A, B, D, DK, F, FIN, IRL, I, S, NL, UK)

Source: EEA.



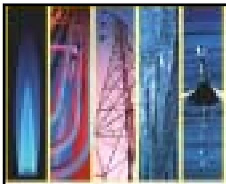
GREENHOUSE GAS EMISSION PROJECTIONS FROM WASTE MANAGEMENT

(CHANGES FROM 1990 TO 2010)



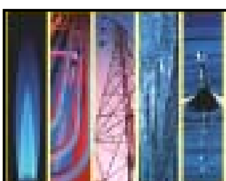
Note: EU-10 emissions and projections are given only for those MS that report projections (A, B, D, DK, F, FIN, IRL, I, S, UK)

Source: EEA.

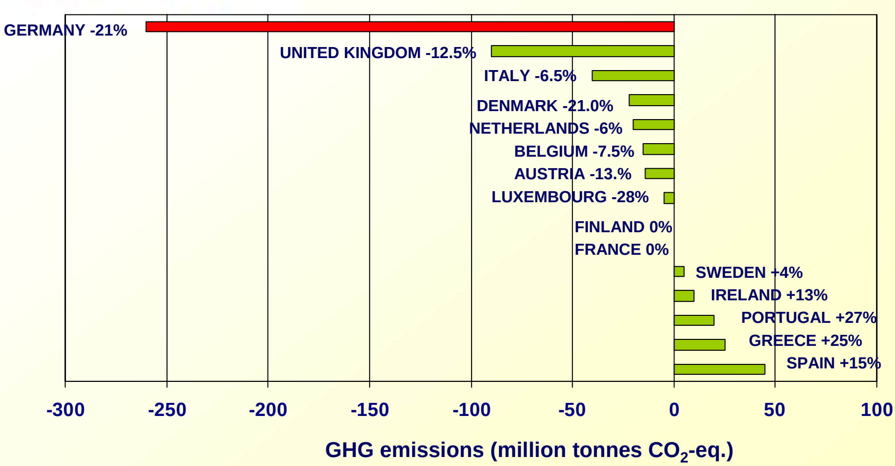


(3) WHICH TARGETS HAVE BEEN SET WITH RESPECT TO

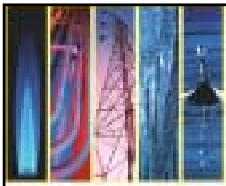
- GHG EMISSIONS
- RENEWABLE ENERGIES
- ENERGY EFFICIENCY?



GREENHOUSE GAS EMISSION TARGETS OF EU MEMBER STATES FOR 2008-12 UNDER THE EU BURDEN-SHARING AGREEMENT



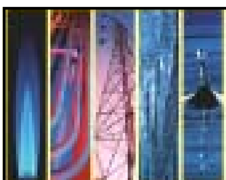
Source: EEA.



THE EU EMISSIONS TRADING REGIME: INDICATIVE SECTORAL TARGETS ACCORDING TO THE GERMAN NATIONAL ALLOCATION PLAN

(Mn tons of CO_2)

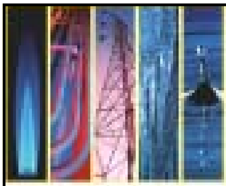
SECTORS / PERIODS	2005 / 2007	2008 / 2012
MANUFACTURING INDUSTRY AND UTILITIES	503	495
PRIVATE HOUSEHOLDS, TRANSPORT, COMMERCIAL SECTOR	356	351
TOTAL	859	846



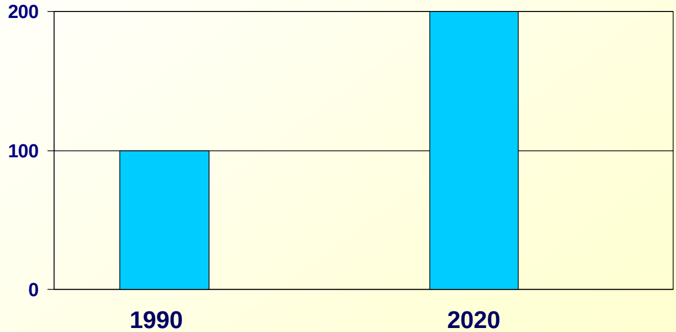
INDICATIVE NATIONAL TARGETS OF GENERATING ELECTRICITY CONSUMPTION FROM RENEWABLES

COUNTRY	% OF ELECTRICITY FROM RENEWABLES IN 1997	% OF ELECTRICITY FROM RENEWABLES IN 2010
DENMARK	8.7	29.0
GERMANY	4.5	12.5
GREECE	8.6	20.1
SPAIN	19.9	29.4
FRANCE	15.0	21.0
ITALY	16.0	25.0
AUSTRIA	70.0	78.1
PORTUGAL	38.5	39.0
FINLAND	24.7	31.5
SWEDEN	49.1	60.0

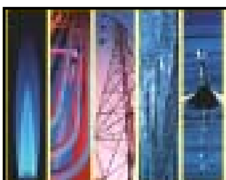
Source: European Commission.



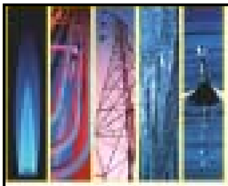
INDICATIVE TARGET OF ENERGY PRODUCTIVITY IN GERMANY



Source: FEDERAL GOVERNMENT OF GERMANY.

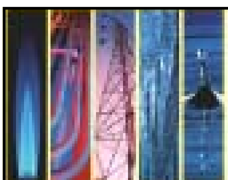


(4) WHAT ARE THE POLICIES AND MEASURES TO ACHIEVE THESE TARGETS?



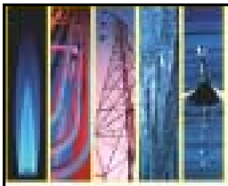
TYPOLOGY OF GHG- AND ENERGY-RELATED MEASURES AND INSTRUMENTS

LEVEL OF INTERVENTION	EUROPEAN UNION FEDERAL GOVERNMENT STATES LOCAL AUTHORITIES GOVERNANCE
FOCUS OF INTERVENTION	SUPPLY-SIDE APPROACHES DEMAND-SIDE APPROACHES
TYPE OF INSTRUMENTS	MORAL PERSUASION COMMAND-AND-CONTROL MARKET-BASED INSTRUMENTS PUBLIC INVESTMENT INSTITUTIONAL INNOVATIONS OTHER PRESSURES
SECTORAL FOCUS OF INTERVENTION	CROSS-SECTORIAL APPROACHES SECTOR-SPECIFIC APPROACHES



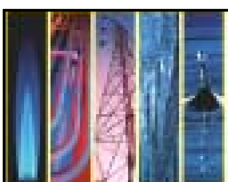
GHG- AND ENERGY-RELATED POLICIES AND MEASURES IN GERMANY BY LEVEL OF INTERVENTION

EU INITIATIVES e.g.	FEDERAL GOVERNMENT e.g.	STATE GOVERNMENTS e.g.	LOCAL AUTHORITIES e.g.	GOVERNANCE e.g.
• EU BURDEN-SHARING AGREE-MENT ON GHG	• ECO-TAXES	• STATE AIDS FOR RENEWABLE ENERGIES	• LOCAL INVEST-MENT IN RENE-WABLE ENERGIES	• LOCAL AGENDA 21
• CO_2 EMISSIONS TRADING	• ELECTRICITY FEED-IN LAW	• STATE ENERGY AGENCIES	• LOCA AGENDA 21	• ROUND TABLES ON ENERGY CONSERVATION
• EU AUTO-OIL AGREEMENT	• RENEWABLE ENERGIES ACT			• NEGOTIATED AGREEMENTS BETWEEN INDUSTRY AND FEDERAL/STATE GOVERMENT
• EU DIRECTIVE ON TOTAL ENERGY EFFICIENCY OF BUILDINGS	• ENERGY CONSERVATION ORDINANCE			
• EU DIRECTIVE ON MAXIMUM ENERGY CON-SUMPTION	• FEDERAL ENERGY AGENCY			



THE GHG- AND ENERGY-RELATED MIX OF POLICY INSTRUMENTS IN GERMANY

MORAL PERSUASION e.g.	COMMAND- AND –CONTROL e.g.	MARKET-BASED INSTRUMENTS e.g.	PUBLIC SECTOR INITIATIVES e.g.	PRESSURES OF OTHER STAKE-HOLDERS e.g.
• SELF-COMMIT-MENTS OF IN-DUSTRIAL MANU-FACTURERS ASSOCIATIONS	• ENERGY CONSERVATION ORDINANCE	• ECO-TAXES	• INVESTMENT IN PV DEMONSTRA-TION PROJECTS	• SUPPLIERS OF RENEWABLE ENERGIES
• ENERGY AGENCY HOTLINE	• ENERGY CONSUMPTION LABELLING ORDINANCE	• CO2 EMISSIONS TRADING	• CONTRACTING	• FINANCIAL SECTOR
• ADVISORY SERVICES	• ORDINANCE ON MAXIMUM ENERGY CONSUMPTION	• CONTRACTING	• GOVERNMENT'S GHG COMMIT-MENTS	• UTILITIES
• ENERGY EFFICIENCY CAMPAIGNS		• LEAST-COST PLANNING		• CONSUMER ASSOCIATIONS
• SOLAR ENERGY CAMPAIGNS		• STATE AIDS		• ENVIRONMENTAL NGOs
		• HIGHWAY TOLL FOR TRUCKS		

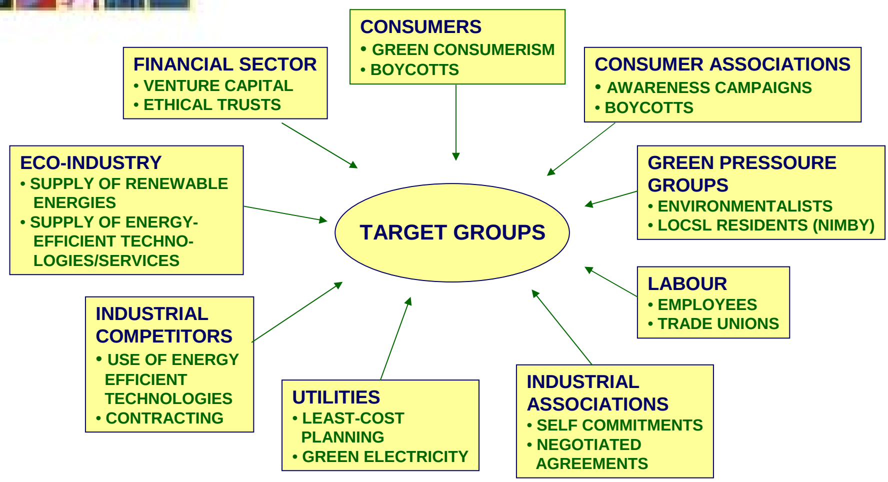


GHG- AND ENERGY-RELATED POLICIES AND MEASURES BY SUPPLY-SIDE AND DEMAND-SIDE APPROACHES

SUPPLY-SIDE APPROACHES e.g.	DEMAND-SIDE APPROACHES e.g.
• NATIONAL ALLOCATION PLAN RE: CO_2 EMISSIONS TRADING	• ECO-TAXES
• ELECTRICITY FEED-IN LAW	• STATE AIDS FOR INSTALLATION OF RENEWABLE ENERGIES
• RENEWABLE ENERGIES ACT	• ENERGY CONSERVATION ORDINANCE
• AUTO-OIL AGREEMENT	• INFORMATION AND AWARENESS CAMPAIGNS
• NEGOTIATED $C0_2$-AGREEMENT WITH INDUSTRIAL MANUFACTURERS ASSOCIATIONS	• 100,000 SOLAR PV ROOFTOP PROGRAMME
• MAXIMUM ENERGY CONSUMPTION STANDARDS	• TAX CREDITS FOR RENEWABLE ENERGY INSTALLATIONS OF PRIVATE HOUSEBUILDERS

Source: IWU.

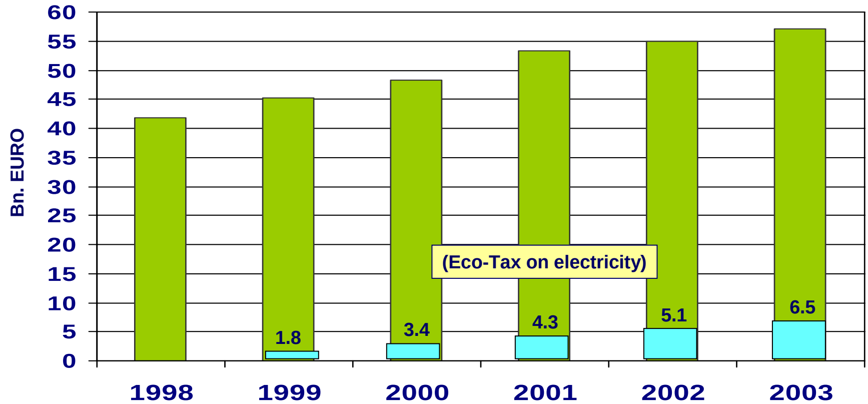
OTHER PRESSURES ON TARGET GROUPS FOR GHG EMISSION REDUCTIONS AND ENERGY CONSERVATION



CROSS-SECTORIAL POLICIES AND MEASURES

REVENUES FROM ENVIRONMENT-RELATED TAXES AND CHARGES IN GERMANY

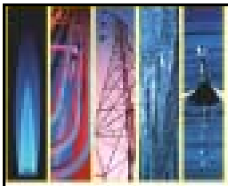
- 1998-2003 -



Source: FEDERAL STATISTICAL OFFICE.

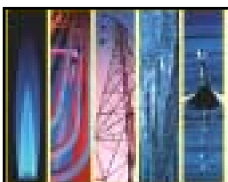
GHG- AND ENERGY-RELATED POLICIES AND MEASURES WITH A SECTORAL FOCUS:

- RENEWABLE ENERGIES SECTOR
- RESIDENTIAL BUILDINGS
- TRANSPORT
- MANUFACTURING INDUSTRIES AND UTILITIES



POLICIES TO PROMOTE THE DEVELOPMENT AND USE OF RENEWABLE ENERGIES IN GERMANY

INSTRUMENTS	FEATURES	IMPLEMEN-TATION PERIOD	MONETARY CE INCENTIVE
ELECTRICITY FEED LAW	REQUIRED UTILITIES TO PURCHASE ELECTRICITY FROM PRIVATE RENEWABLE ENERGY SUPPLIERS	1991 – 2000	€ 639 mn. (1999)
RENEWABLE ENERGIES ACT	FIXED, DEGRESSIVE AND TIME-LIMITED FEED-IN TARIFFS DEPENDING ON TECHNOLOGY CAPACITY, AND LOCATION	2000 -	€ 2,138 mn. (2002)
FEDERAL PRO-GRAMME FOR RENEWABLES	PROVIDED DIRECT INVESTMENT GRANTS	1994 – 1998	€ 100 mn. (total)
MARKET INCENTIVE PROGRAMME	DIRECT INVESTMENT GRANTS AND LOW-INTEREST LOANS	1999 -	€ 102 mn. (2000) € 153 mn. (2001) € 200 mn. (2002)



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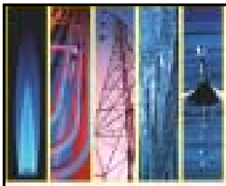
250 MW WIND PROGRAMME	WIND DEVELOPERS RECEIVED OUTPUT OR INVESTMENT SUBSIDIES	1990 – 1995	.
1000/2250 SOLAR PHOTOVOLTAIC ROOFTOP PROGRAMME	GRANTS OR LOW-INTEREST LOANS TO DEMONSTRATE THE USE OF PV ROOFTOPS	1991 – 1995	.
100,000 SOLAR PV ROOFTOP PROGRAMME	GRANTS OR LOW-INTEREST LOANS FOR INCREASING THE INSTALLATION OF PV ROOFTOPS	1999 -	€ 45 mn. (2002)
ECO-TAX	BIO FUELS PARTIAL RARE EXEMPTED; EARMARKING OF REVENUES FOR MARKET INCENTIVE PROGRAMME	1999 -	€ 650 mn. (1999 – 2003)
RESEARCH AND DEVELOPMENT ON RENEWABLES	GRANTS FOR R&D PROJECTS		



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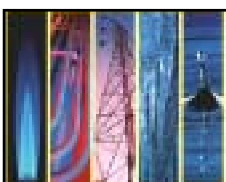
PROGRAMME „SOLAR THERMIE 2000“	DEMONSTRATION PROGRAMME FOR PILOT FACILITIES	1993	€ 92 mn. (2002)
ERP ENVIRONMENTAL PROGRAMME	LOW-INTEREST LOANS FOR RENEWABLE ENERGY INSTALLATIONS	1990 -	€ 41 mn. (2002)
ENVIRONMENTAL PROGRAMME OF DEUTSCHE AUSGLEICHSBANK	LOW-INTEREST LOANS FOR INVESTMENTS IN RENEWABLE ENERGIES	1990 -	€ 139 mn. (2001)
38 PROMOTION PROGRAMMES OF THE STATES	SUPPORT FOR R&D, PILOT AND DEMONSTRATION PROJECTS	1990 -	€ 59 mn. (1997



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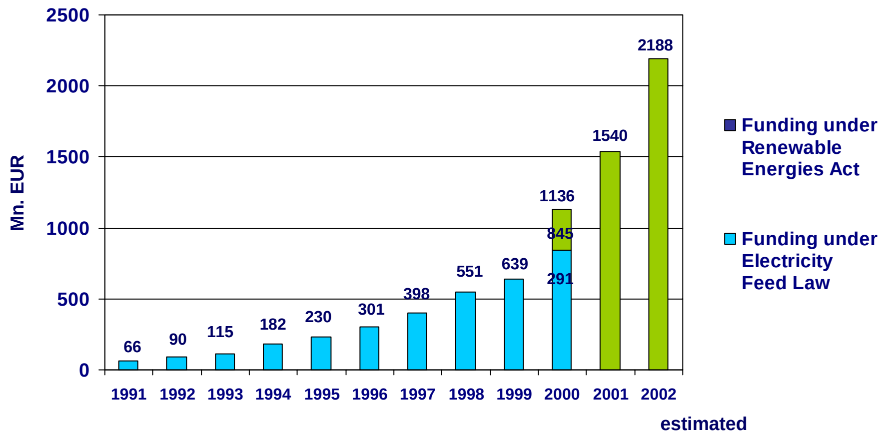
PROMOTION PROGRAMMES OF THE MUNICIPALITIES	SUPPORT OF RENEWABLE ENERGY INSTALLATIONS	1990 -	€ 59 mn. (1997)
TAX CREDITS FOR HOUSEBUILDING	SUPPORT FOR RENEWABLE ENERGY INSTALLATIONS OF PRIVATE HOUSE BUILDERS	1990 -	€ 22 mn. (2002)
LOAN PROGRAMME OF THE BANK FOR RECONSTRUCTION (KFW)	LOW-INTEREST LOANS FOR RENEWABLE ENERGY INSTALLATIONS	1996 -	€ 22 mn. (1997)

Source: www.bmu.de.

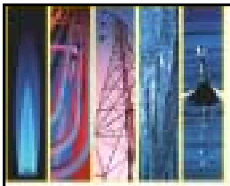
FIXED PREMIUM PRICE FUNDING OF RENEWABLE ENERGIES BY GERMAN UTILITIES

- 1991-2002 -



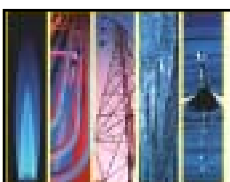
Source: VDEW.

GHG- AND ENERGY-RELATED POLICIES AND MEASURES TARGETED AT THE RESIDENTIAL SECTOR



POLICIES AND INSTRUMENTS TARGETED AT ENERGY CONSERVATION AND GHG EMISSION REDUCTIONS IN THE RESIDENTIAL AND COMMERCIAL SECTOR

INSTRUMENTS	FEATURES	IMPLEMEN-TATION PERIOD
THERMAL INSULATION ORDINANCES (SECOND AND THIRD)	ENERGY EFFICIENCY STANDARDS FOR NEW AND EXISTING BUILDINGS	1984 – 2002
ENERGY CONSERVATION ORDINANCE	SETS STRICTER ENERGY EFFICIENCY STANDARDS; MANDATORY PHASING-OUT OF SMALL BOILERS	2002
ENERGY CONSUMPTION LABELLING ORDINANCE	MANDATORY LABELLING SHOWING INFORMATION ON ENERGY CONSUMPTION OF ELECTRICAL APPLIANCES	1998
ORDINANCE ON MAXIMUM ENERGY CONSUMPTION	FIXES MAXIMUM ENERGY CONSUMPTION VALUES FOR SPECIFIED HOUSEHOLD EQUIPMENT	1998
TAX CREDITS FOR PRIVATE HOUSEBUILDERS	SUPPORT FOR INSTALLATION OF RENEWABLE ENERGY TECHNOLOGIES	1990
ECO-TAXES	NEW ELECTRICITY TAX PROVIDES INCENTIVES AND HIGHER TAXES ON HEATING OIL; NATURAL GAS TO LOWER ENERGY CONSUMPTION	1999 -
ERP ENVIRONMENTAL AND ENERGY SAVING PROGRAMME	LOW –INTEREST LOANS ESPECIALLY FOR SMEs FOR INVESTMENTS IN ENERGY CONSERVATION	1990 -
ENVIRONMENTAL PROGRAMME OF THE DEUTSCHE AUSGLEICHSBANK	LOW –INTEREST LOANS ESPECIALLY FOR SMEs FOR INVESTMENTS IN ENERGY CONSERVATION OR THE USE OF RENEWABLE ENERGY	1990 -
MARKET INCENTIVE PROGRAMME FOR RENEWABLE ENERGIES	INCENTIVES FOR PRIVATE HOUSEOWNERS; HOUSING ASSOCIATIONS, SMEs ETC. TO INSTALL RENEWABLE ENERGY TECHNOLOGIES	1999
SUPPORT PROGRAMME FOR ON-SITE ADVICE	OWNERS OF BUILDINGS CONSTRUCTED BEFORE 1984 ARE GIVEN ADVICE ON ENERGY CONSERVATION	1991 -
ERP ENVIRONMENTAL PROGRAMME	LOW-INTEREST LOANS FOR RENEWABLE ENERGY INSTALLATIONS	1990 -



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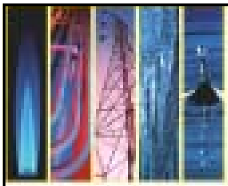

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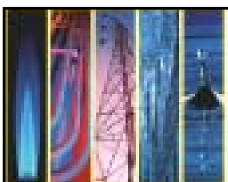
ENVIRONMENTAL PROGRAMME OF DEUTSCHE AUSGLEICHSBANK	LOW-INTEREST LOANS FOR INVESTMENTS IN RENEWABLE ENERGIES	1990 -
38 PROMOTION PRO-GRAMMES OF THE STATES	SUPPORT FOR R&D; PILOT AND DEMONSTRATION PROJECTS	1990 -
PROMOTION PROGRAMMES OF THE MUNICIPALITIES	SUPPORT OF RENEWABLE ENERGY INSTALLATIONS	1990 -
TAX CREDITS FOR HOUSEBUILDING	SUPPORT FOR RENEWABLE ENERGY INSTALLATIONS OF PRIVATE HOUSEBUILDERS	1990 -
LOAN PROGRAMME OF THE BANK FOR RECONSTRUC-TION (KFW)	LOW-INTEREST LOANS FOR RENEWABLE ENERGY INSTALLATIONS AND ENERGY CONSERVATION MEASURES	1996 -
CO_2 BUILDING RENOVATION PROGRAMMES MP0 – MP6 OF THE BANK FOR RECONSTRUCTION (KFW)	LOW-INTEREST LOANS FOR HOUSEOWNERS TO STIMULATE CO_2 EMISSION REDUCTIONS; E.G. BY PHASING –OUT OLD HEATING SYSTEMS OR FOR THE CONSTRUCTION OF ENERGY-EFFICIENT HOUSES OR PASSIVE HOUSES	



GERMAN REGULATIONS REGARDING MAXIMUM ENERGY CONSUMPTION IN NEW RESIDENTIAL BUILDINGS

REGULATIONS	IMPLEMENTATION PERIOD	ENERGY EFFICIENCY STANDARD
1st THERMAL INSULATION ORDINANCE	1977 – 1984	below 200 kWh/m^2/year
2nd THERMAL INSULATION ORDINANCE	1984 – 1995	150 kWh/m^2/year
3rd THERMAL INSULATION ORDINANCE	1995 – 2002	100 kWh/m^2/year
ENERGY CONSERVATION ORDINANCE	2002 -	70 kWh/m^2/year

Source: IWU.

COMPARISON OF THE MINIMUM ENERGY CONSERVATION REQUIREMENTS DEFINED IN THE GERMAN REGULATIONS

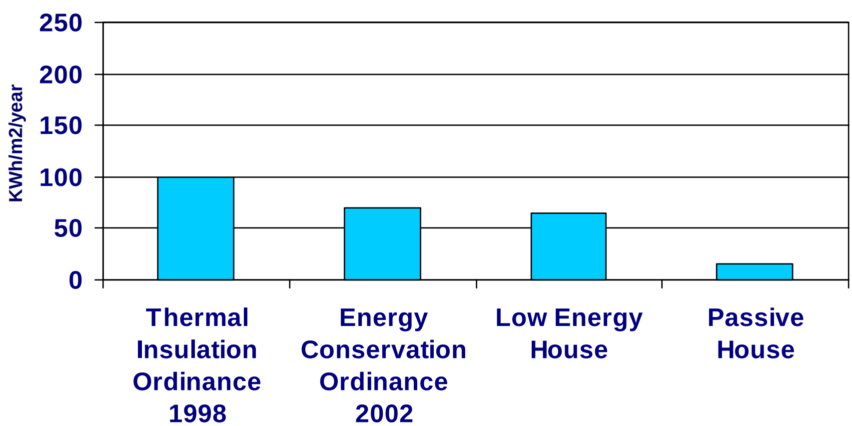
		max. U-Value in W/(m²K)	
		THERMAL INSULATION ORDINANCE (1995)	ENERGY CONSERVATION ORDINANCE (2002)
OUTER WALLS	RENEWAL OF FACADE	0.40	0.35
	INTERIOR RENEWAL	0.50	0.45
CEILING OR ROOF	STEEP ROOF	0.30	0.30
	FLAT ROOF	0.30	0.25
CELLAR CEILING OR GROUND FLOOR	RENEWAL FROM CELLAR	0.50	0.40
	RENEWAL FROM BASEMENT	0.50	0.50
WINDOWS AND DOORS	RENEWAL OF THE GLAZING	-	1.5*
	RENEWAL INCL. FRAME	1.80	1.70
	DOORS	-	2.90

*) U-value of the glazing.

Source: IWU.

ENERGY DEMAND FOR HEATING ACCORDING TO DIFFERENT THERMAL INSULATION STANDARDS

- DETACHED HOUSE -



Source: IWU.

THE COMBINED MINERAL OIL AND ECO-TAX BY TYPE OF ENERGY SOURCE

ENERGY SOURCES	UNITS	MINERAL OIL TAX	MINERAL OIL TAX AND ECO-TAX		
		AS OF MARCH 1999	APRIL - DECEMBER 1999	2001	2003
ELECTRICITY	(CENTS/KWh)	-	1.02	1.64	2.05
HEATING OIL	(CENTS/LITRE)	4.09	6.14	6.14	8.14
HEAVY FUEL OIL	(CENTS/KG)	1.53	1.53	1.79	2.50
NATURAL GAS	(CENTS/KWh)	0.18	0.34	0.34	0.55

Source: BMF.

GHG- AND ENERGY-RELATED POLICIES AND MEASURES TARGETED AT THE TRANSPORT SECTOR

POLICIES AMD MEASURES TARGETED AT GHG EMISSION REDUCTIONS AND ENERGY CONSERVATION IN THE TRANSPORT SECTOR

INSTRUMENTS	FEATURES	IMPLEMEN-TATION PERIOD
MINERAL OIL TAX ON GASOLINE DIESEL	INCENTIVE TO LOWER FUEL CONSUMPTION	
ADDITIONAL ECO-TAX ON FUELS	GRADUAL INCREASE OF THE ECO-TAX ON GASOLINE; DIESEL; NATURAL GAS	1999 -
EMISSION-RELATED VEHICLE TAX	SUPPORT FOR LOW-FUEL-CONSUMPTION CARS	1997
EXEMPTION OF BIOFUELS FROM THE ECO-TAX	INCENTIVE FOR THE INTRODUCTION OF ALTERNATIVE FUELS	1999 -

(Continued)

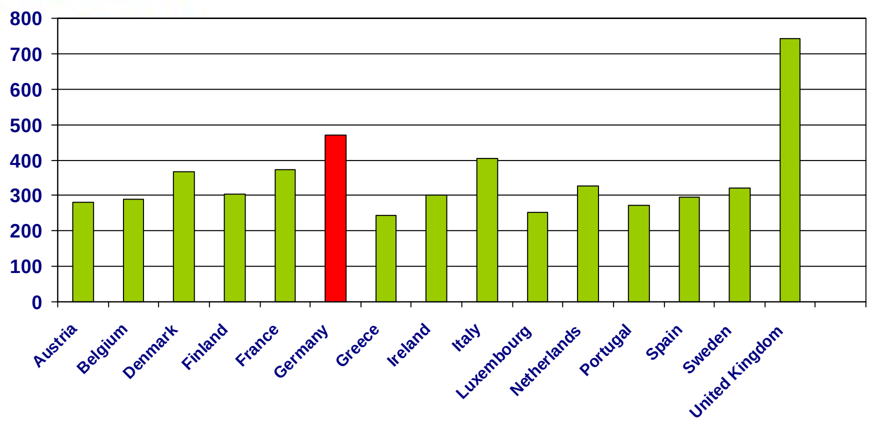
INSTRUMENTS	FEATURES	IMPLEMEN-TATION PERIOD
SELF COMMITMENT OF THE GERMAN AUTOMOTIVE INDUSTRY	TARGET TO ACHIEVE AN AVERAGE FUEL CONSUMPTION OF 5.97 LITRES PER 100 KM BY 2005	2000 -
COMMITMENT OF THE GERMAN AUTOMOTIVE INDUSTRY IN THE CONTEXT OF THE EU AUTO-OIL AGREEMENT	TARGETED AT REDUCTION OF CO_2 AND FUEL CONSUMPTION OF CARS AND TRUCKS	2008 / 2009
HIGHWAY TOLL FOR HEAVY TRUCKS	MILEAGE-BASED ROAD-USER CHARGE	2005

(Continued)

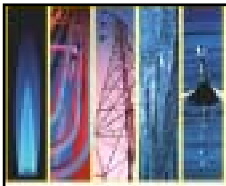
INSTRUMENTS	FEATURES	IMPLEMENTATION PERIOD
MANDATORY VEHICLE INSPECTIONS	AIMED AT PROPER FUNCTIONING OF CATALYTIC CONVERTERS AND PARTICULATE FILTERS	1993 -
ECO-TAXES ON KEROSENE	APPLIES ONLY TO DOMESTIC FLIGHTS	1999 -
EMISSION-RELATED LANDING FEES	TARGETED AT THE MODERNISATION OF AIRLINE FLEETS	2000 -
PUBLIC INVESTMENT TO CHANGE THE MODAL SPLIT	FAVOURS THE MODERNISATION OF THE ENVIRONMENTALLY FRIENDLY RAILWAYS	2001 – 2003

DIESEL TAXATION IN THE EU

- € / 1000 L -

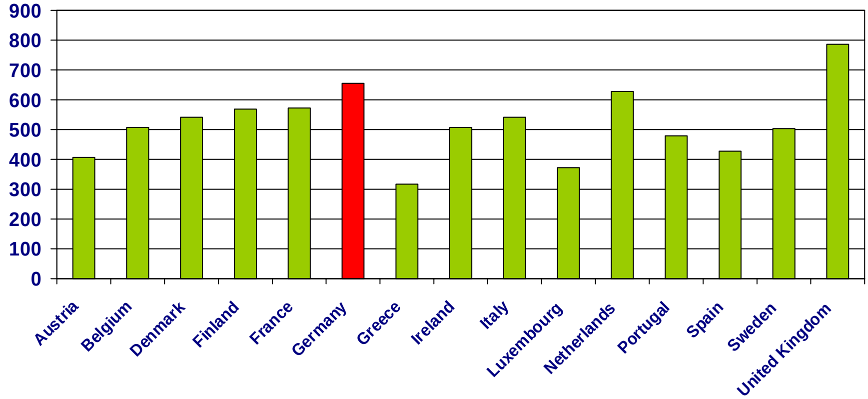


Source: European Commission.

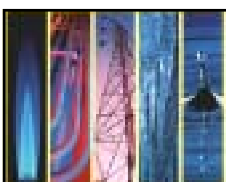


TAXATION OF UNLEADED GASOLINE

- € / 1000 L -

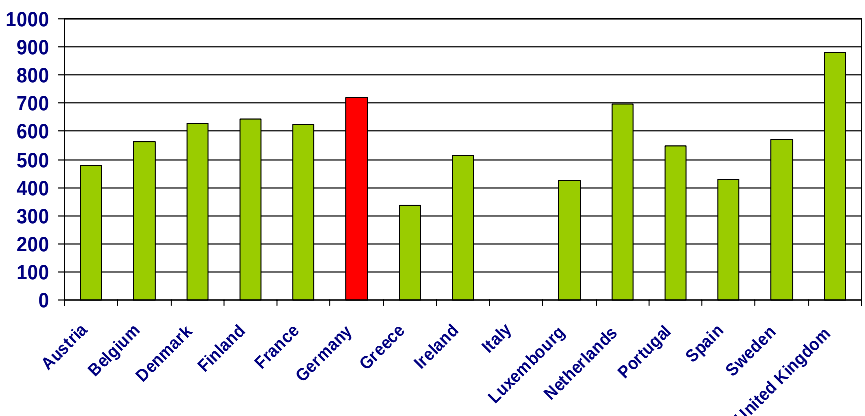


Source: European Commission.



TAXATION OF LEADED GASOLINE

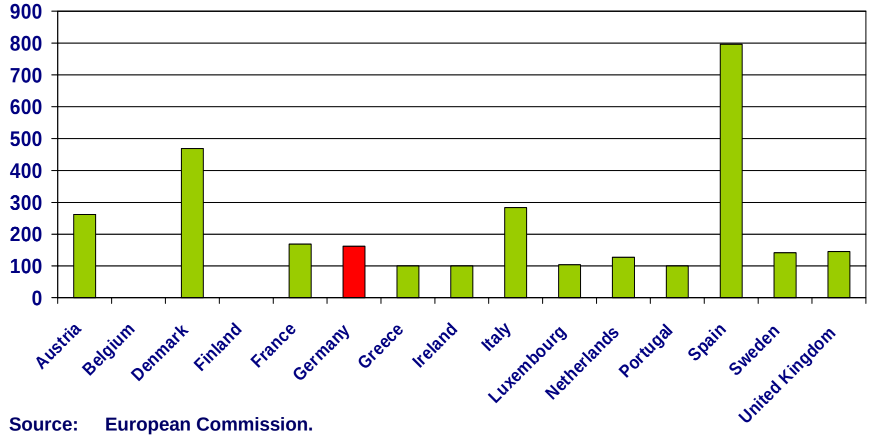
- € / 1000 L -



Source: European Commission.

TAXATION OF LPG

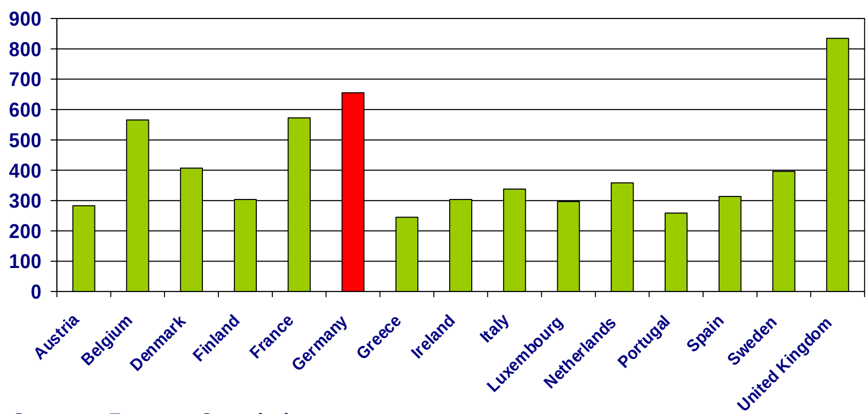
- € / 1000 L -



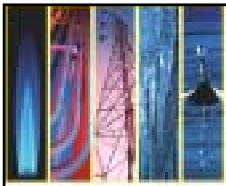
Source: European Commission.

TAXATION OF KEROSENE

- € / 1000 L -



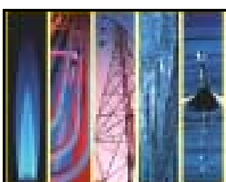
Source: European Commission.



THE COMBINED MINERAL OIL AND ECO-TAX BY TYPE OF FUEL

ENERGY SOURCES	UNITS	MINERAL OIL TAX	MINERAL OIL TAX AND ECO-TAX		
		AS OF MARCH 1999	APRIL-DECEMBER 1999	2001	2003
DIESEL	(CENTS/LITRE)	31.70	34.77	40.91	47.04
GASOLINE	(CENTS/LITRE)	50.11	53.18	59.32	65.45
NATURAL GAS	(CENTS/LITRE)	6.00	7.00	8.00	8.00
LPG	(CENTS/LITRE)	6.00	7.00	7.00	8.00

Source: BMF.

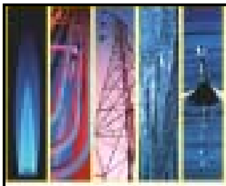


ANNUAL VEHICLE TAXATION IN GERMANY

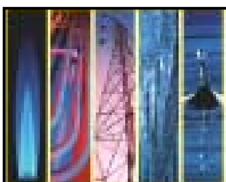
EXAMPLE: 1,400 CC VEHICLE
(E.G. VW GOLF, TOYOTA COROLLA, ETC.)

	PETROL ENGINE	DIESEL ENGINE
	US$	
EURO 4, EURO3, „3 LITRE CAR“	62	166
EURO 2	74	179
EURO 1	131	278
REDUCED EMISSION VEHICLES (LOW EMISSION LEVEL)	183	330
REDUCED EMISSION VEHICLES (MEDIUM EMISSION LEVEL)	254	402
OTHERS	307	453

Source: GTZ.

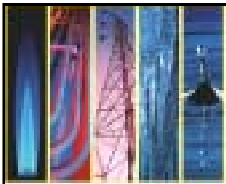


GHG- AND ENERGY-RELATED POLICIES AND MEASURES TARGETED AT THE MANUFACTURING INDUSTRIES AND UTILITIES



POLICIES AND MEASURES TARGETED AT REDUCING GHG EMISSIONS AND INCREASING ENERGY EFFICIENCY IN THE MANUFACTURING INDUSTRIES AND UTILITIES

INSTRUMENTS	FEATURES	IMPLEMENTA-TION PERIOD
SELF-COMMIT-MENTS OF GERMAN INDUSTRIAL ASSOCIATIONS	INVOLVES COMMITMENTS ON SPECIFIC CO_2 EMISSION REDUCTIONS OR ENERGY CONSUMPTION REDUCTIONS	1995/1998 – 2005 2005 2000 - 2005/2012
NATIONAL ALLOCATION PLAN FOR CO_2 EMISSIONS TRADING	COST-EFFECTIVE TRADEABLE ALLOCATION OF CO_2 EMISSION PERMITS GRANDFATHERING	2004
RENEWABLE ENERGIES ACT	UTILITIES HAVE TO PURCHASE RENEWABLE ENERGY AT GUARANTED PRICES; HARDSHIP PROVISION FOR ENERGY-INTENSIVE FIRMS	2003 -



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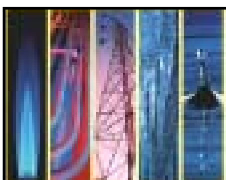
INSTRUMENTS	FEATURES	IMPLEMENTA-TION PERIOD
ECO-TAXES	TAXATION OF ELECTRICTIY; MITIGATION MEASURES FOR ENERGY-INTENSIVE INDUSTRIES	1999 -
SUPPORT OF CONTRACTING	AIMS AT ENERGY-EFFICIENCY BY INTELLIGENT ENERGY SERVICES	2000 -
ENERGY CONSERVATION ORDINANCE	SETS MORE STRINGENT ENERGY-EFFICIENCY STANDARDS FOR SMALL-SCALE COMBUSTION INSTALLATIONS	2002 -
SUPPORT OF COMBINED-HEAT-AND POWER (CHP) INSTALLATIONS AND DISTRICT HEATING (DH)	GUARANTEED ATTRACTIVE FEED-IN TARIFFS FOR CHP DEGRESSIVE BONUS PAYMENTS PER KWH FOR CHP OPERATORS IN ADDITION TO MARKET PRICES	2000 – 2002 2002 - 2010



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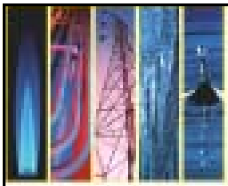
INSTRUMENTS	FEATURES	IMPLEMENTA-TION PERIOD
TAX ALLOWANCES FOR CHP OPERATORS	EXEMPTIONS FROM THE ECO-TAX FOR SMALLER CHP OPERATORS AND FROM THE MINERAL OIL TAX FOR HIGH-EFFICIENCY INSTALLATION	1999 -
GRANT AND LOAN PROGRAMMES OF THE STATES FOR THE DEVELOPMENT OF DISTRICT HEATING	GRANTS AND FREE-INTEREST LOANS IN THE OLD STATES	
LOAN PROGRAMME OF THE BANK FOR RECONSTRUCTION (KFW)	LOW-INTEREST LOANS FOR RENEWABLE ENERGY INSTALLATIONS AND ENERGY CONSERVATION MEASURES	1996 -



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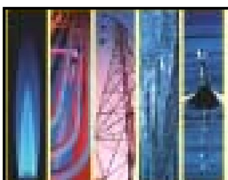
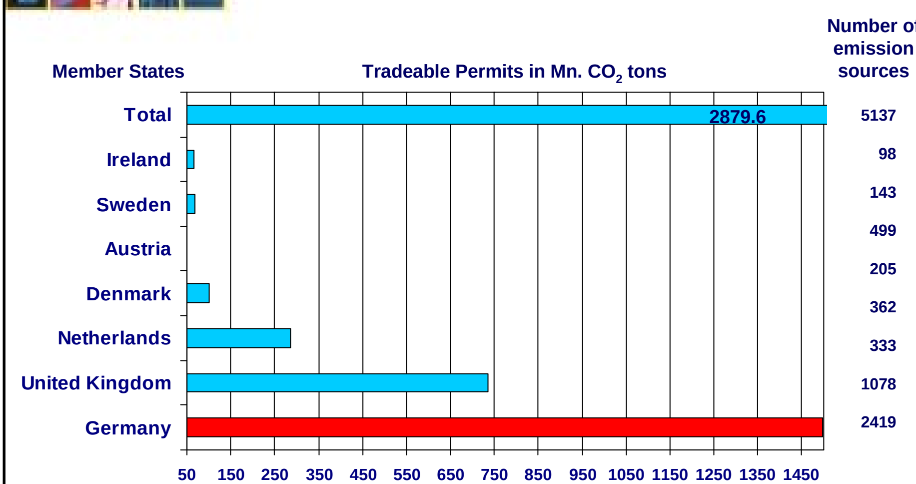
INSTRUMENTS	FEATURES	IMPLEMENTA-TION PERIOD
ERP ENVIRONMENTAL AND ENERGY SAVING PROGRAMME	LOW-INTEREST LOANS ESPECIALLY FOR SMEs FOR INVESTMENTS IN ENERGY CONSERVATION	
EMVIRONMENTAL PROGRAMME OF THE DEUTSCHE AUSGLEICHSBANK	LOW-INTEREST LOANS ESPECIALLY FOR SMEs FOR INVESTMENTS IN ENERGY CONSERVATION ON THE USE OF RENEWABLE ENERGY	

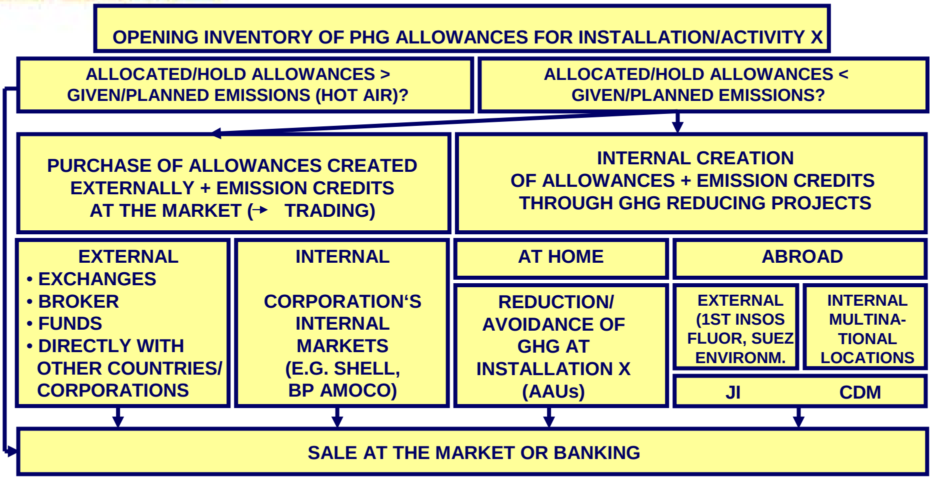


THE EU EMISSIONS TRADING REGIME: VOLUME OF TRADEABLE CO_2-PERMITS BY COUNTRY



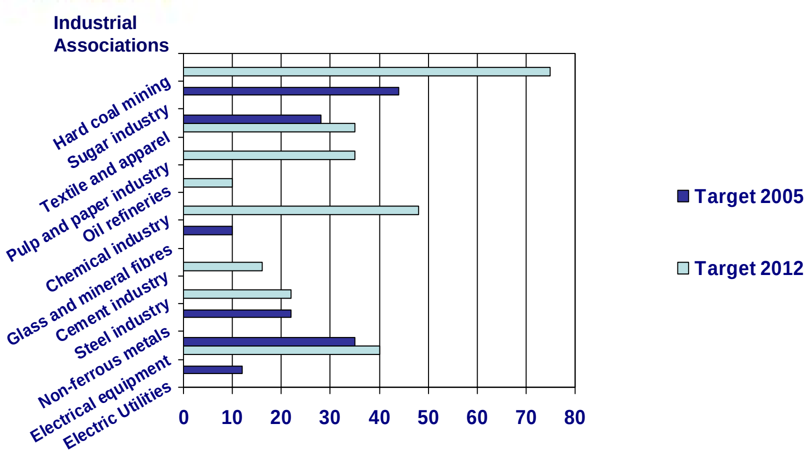
Source: EUROPEAN COMMISSION.

THE EU EMISSIONS TRADING REGIME: OPTIONS FOR GHG EMISSION SOURCES



GHG EMISSION REDUCTION TARGETS (2005/2012) AS A RESULT OF COMMITMENTS OF THE GERMAN INDUSTRY

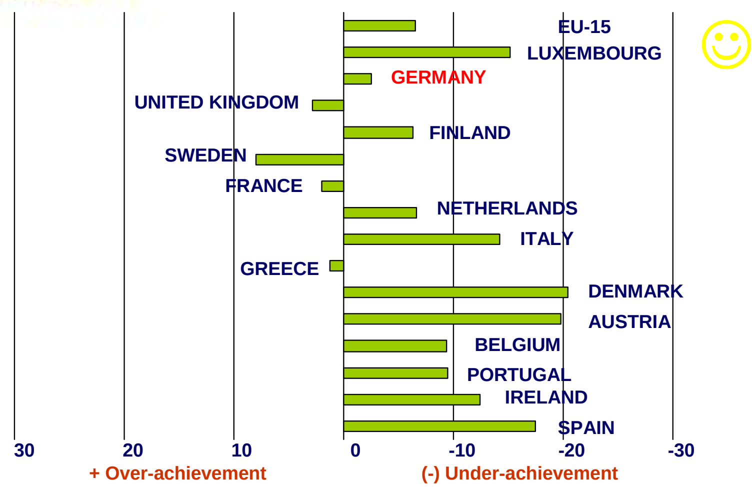
- IN p.c. COMPARED TO 1990 -



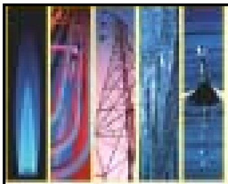
Source: RWI.

(5) WHAT IS THE ACTUAL PROGRESS?

DISTANCE-TO-TARGET (KYOTO PROTOCOL BURDEN-SHARING TARGETS FOR EU MEMBER STATES IN 2002)

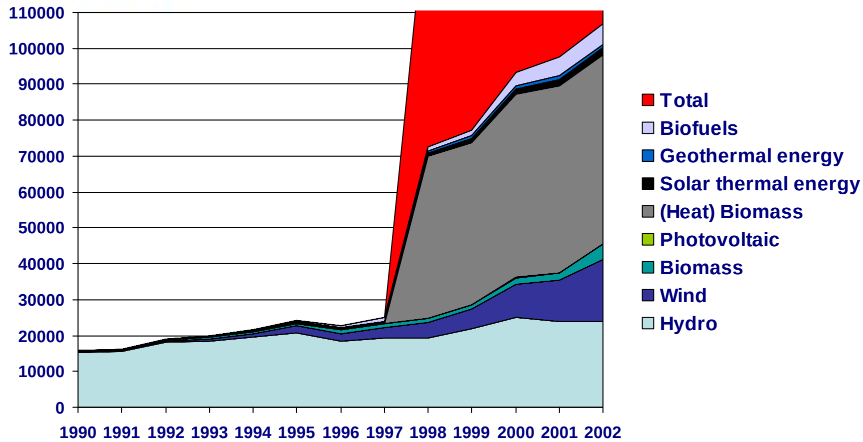


Source: DIW.

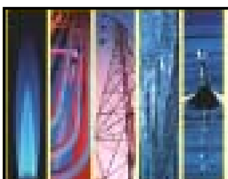


ENERGY SUPPLY BY RENEWABLE ENERGIES

(1990 - 2002)



Source: AGEB; EnBW Ingenieure; VIK; BWE; DIW, DFS; ZSW.

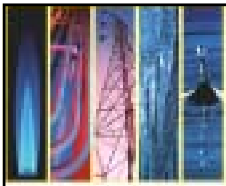


CO_2 EMISSIONS OF THE GERMAN TRANSPORT SECTOR

- MILLION TONNES -

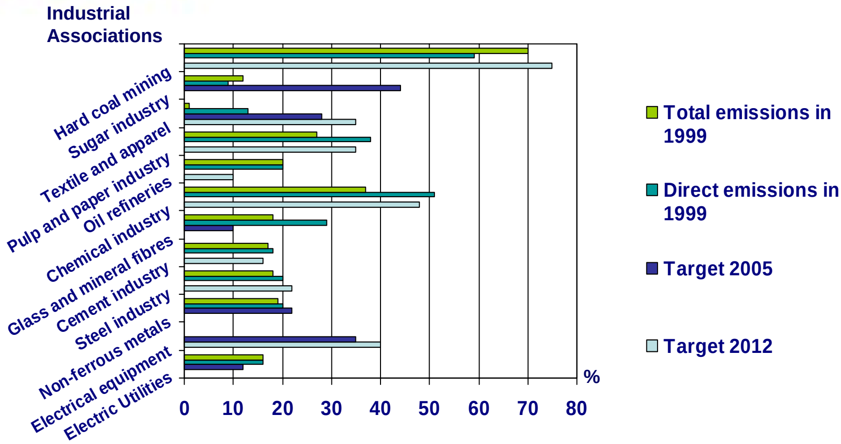
	1990	1995	2002	CHANGES IN P.C.	
				1990/1999	1999/2002
RAILWAYS	2.9	2.3	1.7	-1.0	-0.2
ROAD	150.3	165.0	164.8	24.6	-10.1
AIR	2.9	3.5	4.3	1.3	0.1
INLAND WATERWAYS	2.1	1.7	0.8	-1.1	-0.1
TRANSPORT TOTAL	158.1	172.5	171.6	23.8	-10.3

Source: DIW.

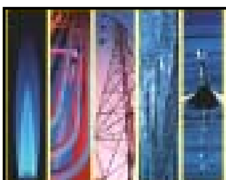


GHG EMISSION REDUCTIONS AS A RESULT OF COMMITMENTS OF THE GERMAN INDUSTRY: TARGETS (2005/2012) AND DISTANCE TO TARGETS (1999)

- IN p.c. COMPARED TO 1990 -

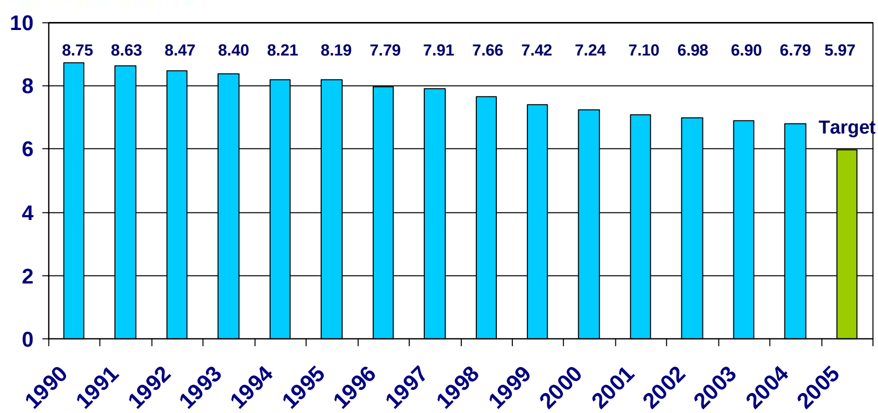


Source: RWI.

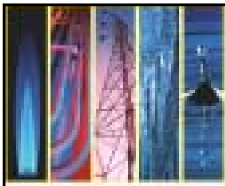


AVERAGE FUEL CONSUMPTION OF PASSENGER CARS PRODUCED IN GERMANY

- LITRES PER 100 km -

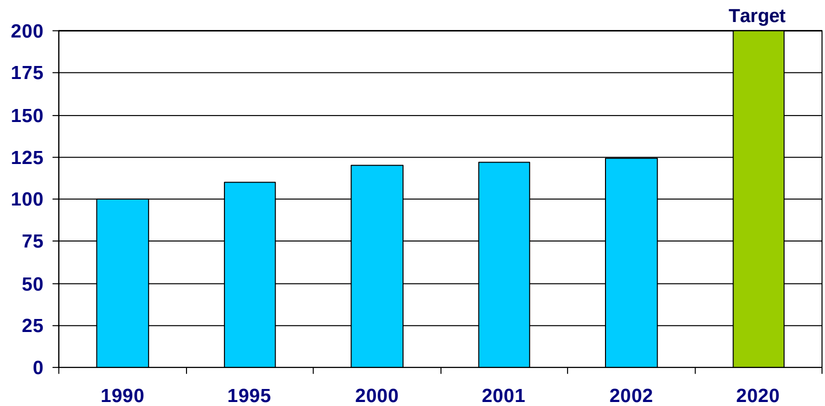


Source: VDA.

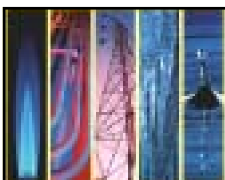


HOW RAPIDLY IS ENERGY PRODUCTIVITY INCREASED?

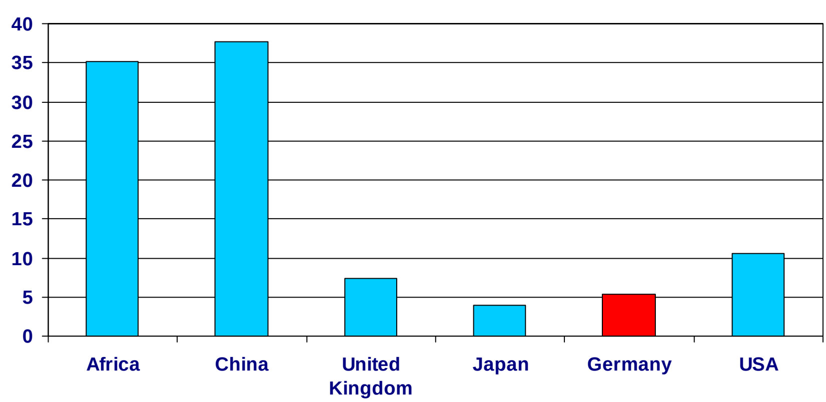
- in p.c. -



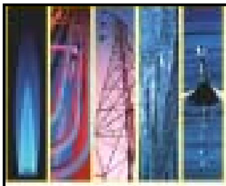
Source: FEDERAL GOVERNMENT OF GERMANY.



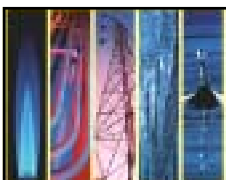
ENERGY INTENSITY IN 2001



Source: IEA.

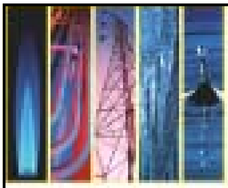


(6) WHAT ARE THE EFFECTS OF THE POLICIES AND MEASURES?



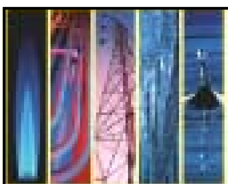
METHODOLOGICAL PROBLEMS INVOLVED IN ESTIMATING THE EFFECTS OF SPECIFIC POLICIES AND MEASURES:

- PREDOMINANCE OF POLICY PACKAGES INCLUDING MIX OF INSTRUMENTS WITH CROSS-SECTORIAL AND/OR SECTOR-SPECIFIC ORIENTATION
- THEREFORE, THERE ARE INHERENT DIFFICULTIES IN DISENTANGLING SPECIFIC EFFECTS OF SPECIFIC MEASURES
- ONLY IN EXCEPTIONAL CASES, A QUANTIFICATION MAY BE FEASIBLE (EXAMPLES: STATE AID PROGRAMMES)



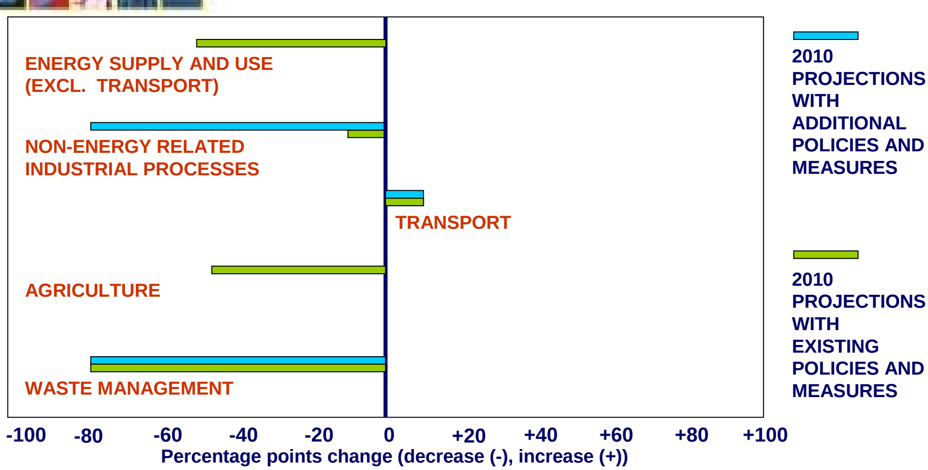
➡ **A FEW EXAMPLES ARE GIVEN:**

- **ESTIMATES OF OVERALL EFFECTS OF MEASURES**
- **ESTIMATES OF EFFECTS OF INDIVIDUAL MEASURES**

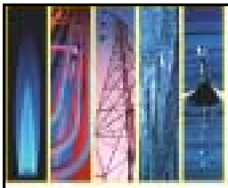


GHG EMISSION PROJECTIONS FOR GERMANY BASED ON EXISTING AND EDDITIONAL POLICIES AND MEASURES

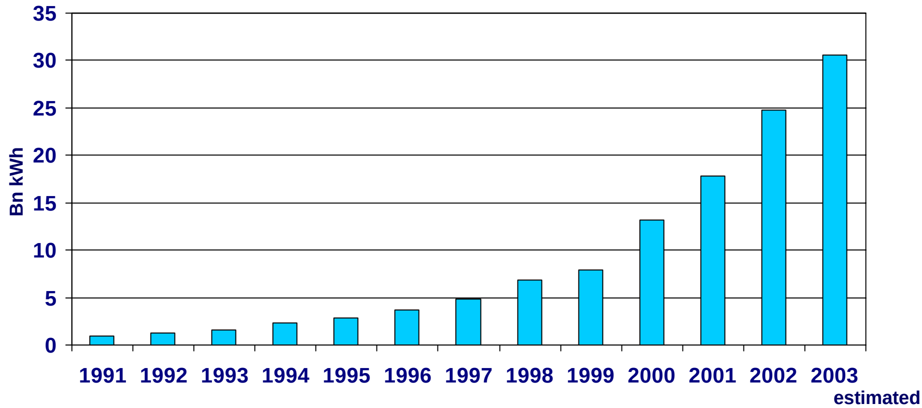
(CHANGES FROM 1990 TO 2010)



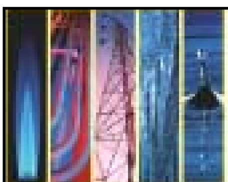
Source: EEA.



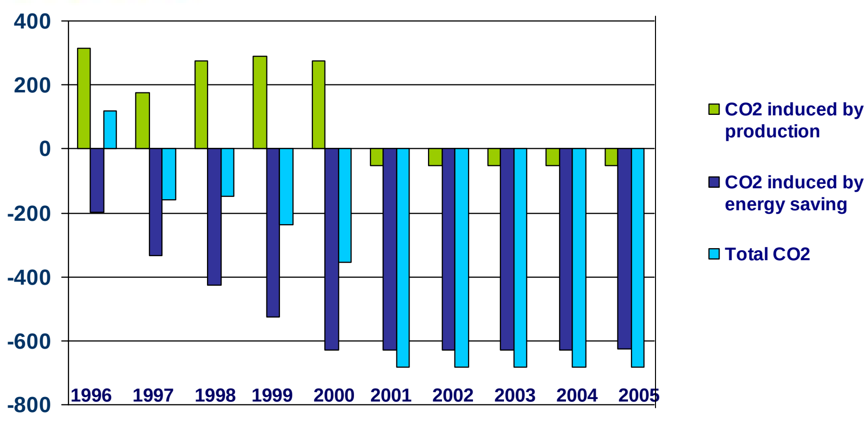
ELECTRICITY FED IN DUE TO ELECTRICITY FEED LAW AND RENEWABLE ENERGIES ACT



Source: VDN.



CO_2 CHANGES AS A RESULT OF A LOW-INTEREST SUBSIDY PROGRAMME OF 2.5 BN €

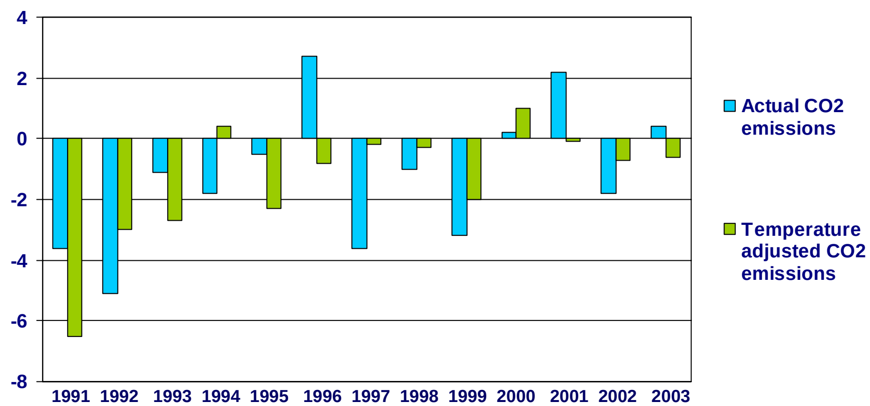


Source: DIW.

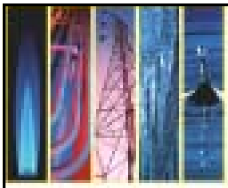
(7) WHAT IS THE CONTRIBUTION OF OTHER DETERMINANTS?

THE IMPACT OF TEMPERATURE ON CO_2 EMISSIONS IN GERMANY: 1990 TO 2003

- YEARLY CHANGES -

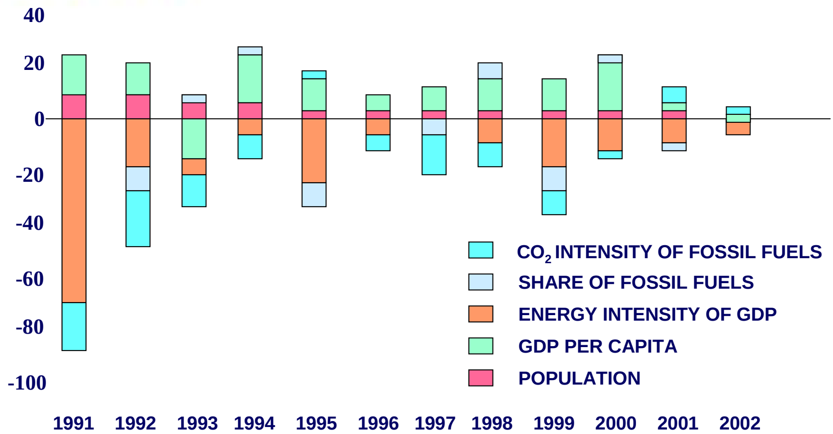


Source: DIW.

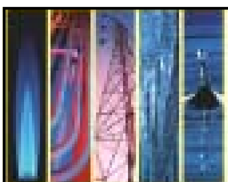


CONTRIBUTION OF MAIN DRIVING FORCES ON CHANGE OF CO_2 EMISSIONS IN GERMANY

- 1990-2002 -

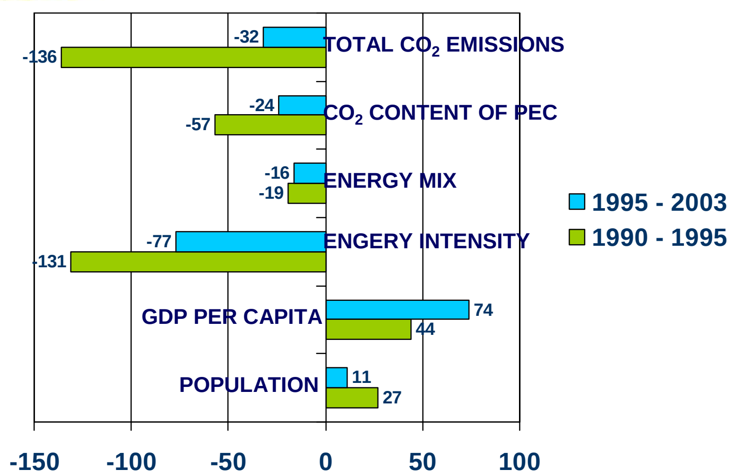


Source: DIW.



MAJOR DETERMINANTS OF ENERGY-RELATED CO_2 EMISSIONS IN GERMANY

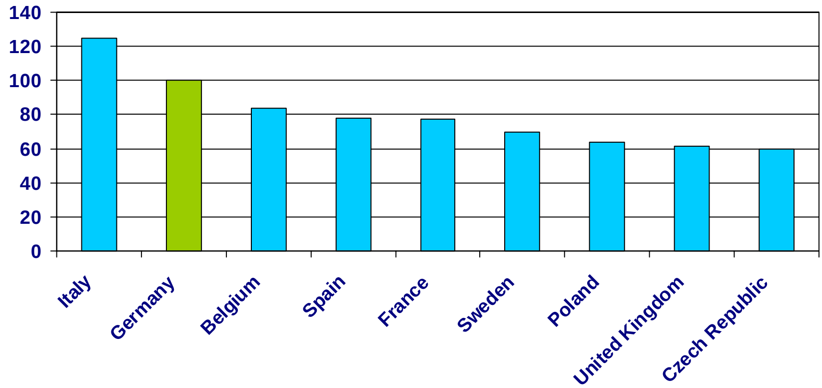
- CHANGES IN MILLION TONNES CO_2 -



Source: DIW.

ELECTRICITY PRICES FOR INDUSTRIAL LARGE-SCALE CONSUMERS IN THE EU[1)]

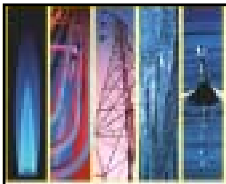
(AS OF JANUARY 2004)



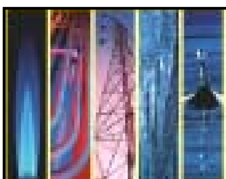
1) Minimum electricity purchase of 50 GWh / except for France.

Source: EUROSTAT.

(8) WHAT ARE THE LESSONS TO BE LEARNED?



CAN GERMANY BE DUBBED A SUCCESS STORY?



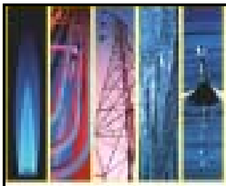
➡ GHG EMISSION REDUCTIONS

PRESENTLY, GERMANY APPEARS TO BE ON TRACK TOWARDS REACHING IST BURDEN-SHARING TARGET. THE MAIN REASONS FOR THIS FAVOURABLE TREND WERE INCREASING EFFICIENCY IN POWER AND HEATING PLANTS AND THE ECONOMIC RESTRUCTURING OF THE FIVE NEW SATES FOLLOWING GERMAN REUNIFICATION. IN GERMANY THESE CIRCUMSTANCES ACCOUNTED FOR ABOUT HALF OF THE REDUCTIONS FOR ALL GHG, WHILST SPECIFIC POLICIES AND MEASURES ACCOUNT FOR THE REMAINING HALF.

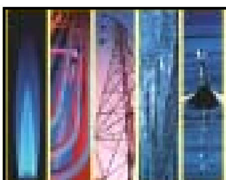
OVER MORE THAN A DECADE GHG IN GERMANY DECREASED IN MOST SECTORS (ENERGY SUPPLY AND USE, INDUSTRY, AGRICULTURE, AND WASTE MANAGEMENT). HOWEVER, THESE REDUCTIONS WERE PARTLY OFFSET BY SUBSTANTIAL INCREASES IN TRANSPORT, WITH ROAD TRANSPORT BEING THE LARGEST SOURCE. IN MOST SECTORS IT CAN BE ASSUMED THAT EXISTING POLICIES AND MEASURES WILL BE SUFFICIENT TO MEET GERMANY'S BURDEN-SHARING TARGETS.

➡ RENEWABLE ENERGIES

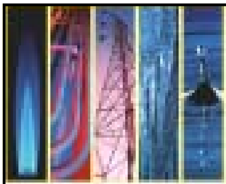
THE DEVELOPMENT OF RENEWABLE ENERGY IN GERMANY HAS BEEN A GREAT SUCCESS: RENEWABLE ENERGY TARGETS FOR GERMANY ARE LIKELY TO BE MORE THAN MET UNDER CURRENT TRENDS: 9% SHARE OF GREEN ELECTRICITY IN 2002, WORLD LEADER IN TERMS OF INSTALLED WIND CAPACITY AMOUNTING TO 13,512 MW IN OCTOBER 2003 (NEARLY 40% OF THE GLOBAL CAPACITY), SECOND TARGEST INSTALLED PHOTOVOLTAIC CAPACITY IN THE WORLD (NEARLY 350 MW AS OF SEPTEMBER 2003), EUROPEAN LEADER IN THE SALE OF BIODIESEL (550,000 TONNES PER YEAR AT THE END OF 2002) AND IN SOLAR HEATING SYSTEMS, WITH 4.75 MILLION m^2 OF INSTALLED SYSTEMS AT THE END OF 2002.



SINCE 1991, WITH THE COMING INTO FORCE OF THE FIRST GERMAN FEED-IN LAW, FIXED REMUNERATION HAS BEEN PAID TO ELECTRICITY BASED ON RENEWABLE ENERGY SOURCES (RES), LEADING TO THE MARKET BREAKTHROUGH IN WIND ENERGY. ITS SUCCESSOR, THE RENEWABLE ENERGIES ACT IN APRIL 2000, IMPROVED THE PREVIOUS REGULATIONS IN MANY RESPECTS AND MADE MARKET ENTRY POSSIBLE FOR OTHER RENEWABLES SUCH AS SOLAR PHOTOVOLTAICS AND BIOMASS ENERGY.



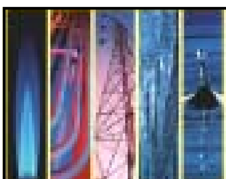
THE POSITIVE RES DEVELOPMENT IN GERMANY CAN ALSO BE EXPLAINED BY SEVERAL PROMOTION PROGRAMMES, WHICH SUPPORTED RES THROUGH INVESTMENT SUBSIDIES, TAX EXEMPTIONS OR IN A MORE INDIRECT WAY, THROUGH THE DECISION TO PHASE OUT NUCLEAR ENERGY, BY MEANS OF INFORMATION DISSEMINATION AND CORPORATE FINANCING SCHEMES IN THE CASE OF WIND ENERGY. THIS SUCCESS STORY IS THE RESULT OF A PACKAGE OF SUPPORT ACTIVITIES.



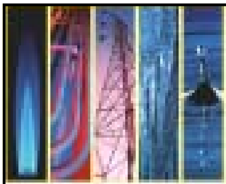
ENERGY EFFICIENCY

THE OVERALL EFFICIENCY WITH WHICH ENERGY IS CONVERTED FOR FINAL CONSUMPTION REMAINED FAIRLY CONSTANT OVER THE LAST DECADE. OBVIOUSLY, EFFICIENCY GAINS IN CONVERSION PROCESSES WERE OFFSET BY CONVERTED FUELS (E.G. ELECTRICITY, REFINED PETROLEUM PRODUCTS) TAKING A LARGER SHARE OF FINAL ENERGY CONSUMPTION.

FINAL ENERGY INTERSITY IN GERMANY (I.E. FINAL ENERGY CONSUMPTION PER UNIT OF GDP) FELL BY AN AVERAGE OF 1.1 P.C. PER ANNUM BETWEEN 1995 AND 2003 AND WAS LESS THAN FOR EARLIER YEARS.



IT APPEARS THAT FROM 1995 TO 2003 THE COMBINATION OF ABUNDANT ENERGY SUPPLIES, LOW FOSSIL FUEL PRICES AND A GENERALLY LOW PREFERENCE FOR ENERGY SAVING HAS RESULTED IN A SLOWER RATE OF IMPROVEMENT COMPARED TO THE PERIOD OF 1990 TO 1995.



SALIENT POLICY ISSUES

FOR REDUCTIONS OF GHG EMISSIONS AND INCREASES IN RENEWABLE ENERGIES AND ENERGY EFFICIENCY, THERE IS NO SUCH THING AS A CURE-ALL, A SINGLE MULTI-PURPOSE POLICY OR INSTRUMENT.
THE CASE OF GERMANY CLEARLY DEMONSTRATES THAT PROGRESS CAN ONLY BE ACHIEVED BY AN INTELLIGENT MIX AND COMBINATION OF WELL ADJUSTED, COMPLEMENTARY AND MUTUALLY RE-INFORCING APPROACHES.
A SUCCESSFUL POLICY PACKAGE CANNOT BE CONSIDERED AS A ONE-OFF DECISION-MAKING, IT RATHER NEEDS CAREFUL MONITORING AND, IF NECESSARY, FINE-TUNING OR EVEN RE-REGULATION.