Factors underpinning future action
2007 update

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EXECUTIVE SUMMARY

The objective of this report is to provide an analytical basis to underpin discussions on future commitments to reduce greenhouse gas (GHG) emissions at the end of the first Kyoto Protocol commitment period (i.e. post-2012). The report is an update of the first version published 23 October 2006.

The future development of the international climate regime is discussed in various fora: The Parties to the UNFCCC discuss these issues in a "dialogue" ending 2007. The Parties to the Kyoto Protocol have initiated the discussion on new commitments for Annex I countries in an "Ad-hoc Working Group (AWG)". Outside of the UNFCCC and the Kyoto Protocol several official fora deal with the issue at the high political level (e.g. Gleneagles dialogue as a follow-up of the G8 process, the Asia Pacific Partnership on Development and Climate) or at a conceptual level (e.g. CCAP dialogue on future action, Basic Project).

Discussions in all these for a need a sound analytical data basis on the current situation of countries and the possible impacts that a future regime designs could have on the individual countries. This project addresses these data needs.

The project report provides (1) fact sheets with detailed data for 60 countries and (2) calculations of the implications of future climate regime architectures on emission allowances on a country level.

The fact sheets, such as in Figure A, provide emissions and underlying drivers on a detailed level as well as a summary of the policies by these countries. The fact sheets provide the differences between countries graphically at a glance. The fact sheets are provided in Appendix A. Accompanying electronic spreadsheet tables provide numerical information for detailed analysis.

The fact sheets show that countries are very diverse – almost all of the countries considered have a characteristic that is unique. In particular small countries have specific national circumstances, e.g. New Zealand with a very large share of emissions from agriculture or Denmark with large inter-annual variations in emissions due to varying electricity trade. Large countries also have unique characteristics, such as Brazil with a major share of hydropower in electricity generation and biofuels in transport but very high emissions in agriculture, Canada with large inter-annual variations of emissions from land use change and forestry or France with a very high share of nuclear power. A separate summary gives an overview of different types of already existing commitments on voluntary greenhouse gases targets as well as targets on renewable energy, biofuels, energy efficiency, waste, energy intensity, and emission trading for 41 countries.

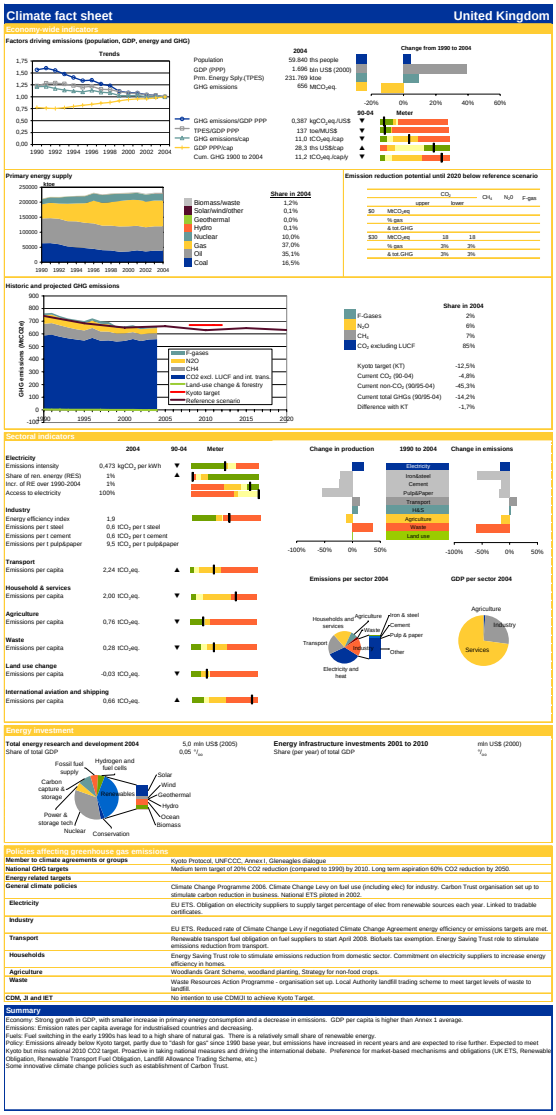

Figure A. Example fact sheet

In the second part of the report, we assessed implications of different future climate change regime architectures on countries' emission allowances. Three levels of ambition 450, 550 and 650 parts per million by volume carbon dioxide equivalent (ppmv CO_2eq.) were explored for 2020 and 2050. We calculated emission allowances (before trading) on a country level, and assessed the differences, for six approaches: "Contraction and Convergence", "Common but Differentiated Convergence", Multistage, Triptych, a sectoral approach and intensity targets. We also provided a sensitivity analysis for seven alternative ways to share emission allowances among Annex I countries for the 550 ppmv CO_2eq. case. We assumed a 20% and a 30% reduction in Annex I emissions compared to 1990 levels by 2020 and looked at equal percentage reduction of CO_2eq. emissions, intensity targets, convergence of CO_2eq. emissions per GDP, convergence of CO_2eq. emissions per capita, the Brazilian historical responsibility proposal, Triptych and sectoral targets.

An example result is shown in Figure B. It shows the change in emission allowances from 2010 (the Kyoto targets, the national target for the USA and reference emissions for economies in transition) to 2020 under the 550 ppmv CO_2eq. case for Annex I countries for various approaches. It illustrates the reduction effort after the first commitment period of the Kyoto Protocol. Ranges of the error bars are due to the use of various future scenarios.

From the analysis we find that substantial emission reductions are necessary to achieve the stabilization goals. Annex I countries need to reduce emissions -15% to -30% below 1990 level in 2020 and -55% to -90% in 2050 for the case stabilizing at 550 ppmv CO_2eq. Table A presents the general ranges of necessary reductions. Generally the differences per Annex I country between the approaches are small. For most approaches the emission allowances differ for the majority of countries only by around 5 to 10 percentage points per country. For most countries, they are around 10 to 20 percentage points more stringent that the Kyoto targets.

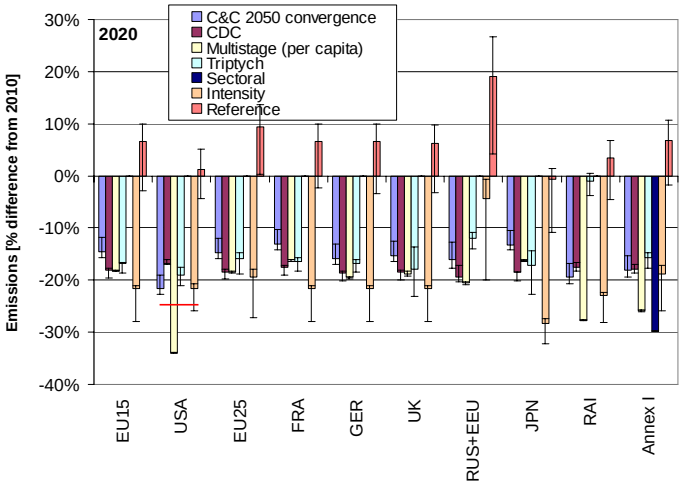

Figure B. Example result: Change in emission allowances from 2010 (mostly Kyoto target level) to 2020 under the 550 ppmv CO_2eq. scenario for Annex I countries for various future approaches. Ranges are due to the use of the different IPCC SRES scenarios. The red horizontal bar indicates the Kyoto target of the USA in relation to its 2010 emissions.

Table A. Ranges of emission reductions according to all applied approaches as percentage change from 1990 under the 450, 550 and 650 ppmv CO_2eq. scenarios. The rounded figures include the whole scenario ranges.

		2020			2050		
450 ppmv CO_2eq.	Global *	+10%			-40%		
	EU 25	-40%	to	-30%	-90%	to	-75%
	UK	-45%	to	-35%	-95%	to	-80%
	Annex I	-45%	to	-25%	-95%	to	-70%
	Non-Annex I	Substantial deviation from reference in all regions			Substantial deviation from reference in all regions		
550 ppmv CO_2eq.	Global *	+30%			-10%		
	EU 25	-30%	to	-20%	-90%	to	-60%
	UK	-35%	to	-25%	-90%	to	-70%
	Annex I	-30%	to	-15%	-90%	to	-55%
	Non-Annex I	Substantial deviation from reference in Latin America, Middle East, Centrally Planned Asia and East Asia			Substantial deviation from reference in all regions		
650 ppmv CO_2eq.	Global *	+50%			+45%		
	EU 25	-20%	to	-10%	-65%	to	-40%
	UK	-25%	to	-15%	-65%	to	-50%
	Annex I	-15%	to	0%	-75%	to	-25%
	Non-Annex I	Deviation from reference in Latin America and Middle East, East Asia			Deviation from reference in most regions, especially in Latin America and Middle East and Centrally Planned Asia		

* Global reduction values are chosen to represent one possible path towards the given stabilisation level. Other global emission levels in 2020 and 2050 would be possible to reach the same stabilisation levels, and their choice would influence the necessary reductions for the country groups.

We also qualitatively assessed the strengths and weaknesses of the major approaches as summarised in Table B. All approaches have their particular strengths and weaknesses. A very simple approach (such as Contraction and Convergence) is clear and easily understandable, but cannot explicitly address the particular national circumstances of individual countries. Complex formulas for future commitments, which can accommodate particular national circumstances, may be difficult to comprehend and to negotiate. Consequently, the final approach will always be a compromise that satisfies the views of countries only partly.

Table B. Summary of the strengths and weaknesses of the major approaches

	Strengths	Weaknesses
Contraction & Convergence	• Participation of all countries • Certainty about global emissions • Simple, clear concept • Includes cost-effective reduction options in developing countries through full international emissions trading • Support for least developed countries through excess emission rights • Compatible with Kyoto Protocol (reporting and mechanisms, CDM not necessary)	• National circumstances (including historical responsibility) not accommodated (optionally countries within one region can redistribute allowances to accommodate national concerns) • Substantial reduction for countries with high per capita emissions, also developing countries • Also least developed countries need to be capable of participating in emissions trading (national greenhouse gas inventories and emission trading authorities) • Excess emission rights for least developed countries need to be compensated by more stringent reduction targets for developed countries.
Common but diff. convergence	• Applies simple rules, thus, making approach transparent and comprehensive • Delay of non-Annex I countries takes account of the responsibility for past emissions • Certainty about global emissions • Eliminates the component of “hot air” (no excess allowances for low emission countries) • Compatible with Kyoto Protocol (reporting and mechanisms)	• National circumstances not accommodated, except per capita emissions and current membership of Annex I • Possibly too simple and not considering detailed national circumstances
Multistage	• Gradual phase-in of countries, in line with UNFCCC spirit, taking into account national circumstances • General framework that can accommodate many ideas and satisfy many demands • Allows for gradual decision making • Trust-building as industrialised countries take the lead • Compatible with Kyoto Protocol (reporting and mechanisms)	• Can lead to a complex system, requires many decisions and allows for exceptions • Risk that countries enter too late so that some long-term stabilisation options are lost • Incentives needed for countries to participate in a certain stage
Triptych	• National circumstances are explicitly accommodated • Explicitly allowing for economic growth at improving efficiency in all countries • Aims to put internationally competitive industries on the same level • Has successfully been applied (on EU level) as a basis for negotiating targets • Compatible with Kyoto Protocol (reporting and mechanisms)	• High complexity of the approach requires many decisions and sectoral data, making global application a challenge and may be perceived as not transparent • Agreement on required projections of production growth rates for heavy industry and electricity may be difficult
Sectoral	• Explicit consideration of national circumstances per sector • Provides focus on most important sectors and particular reduction options • If dynamic, provides flexibility and allows for growth in production • Makes participation of many selected sectors and consequently of countries easier • If applied equally globally, decreases competitiveness concerns • Can be build into the Kyoto system	• Only partial coverage of sectors may make it less feasible to reach low stabilisation levels • Requires detailed sectoral information, which is currently only available for selected countries and sectors • Require careful target setting • Reduce certainty on the global emission level, environmental effectiveness not guaranteed since increases in production volumes (and thus GHG emissions) are possible
Intensity	• Allowing for economic growth and focuses on improving the carbon efficiency of the economy • Compatible with Kyoto Protocol (reporting and mechanisms), but requires additional rules for emission trading	• Uncertainty of the global emission level, environmental effectiveness not guaranteed • Problematic if GDP is reduced due to economic difficulties • Such targets are difficult to set and to compare between countries • Requires monitoring of the GDP

We draw the following general conclusions from this work:

- *Emissions need to be reduced:* Significant reductions below 1990 levels for all approaches and stabilisation levels are necessary from developed countries, in addition to early deviation from reference in developing countries.
- *The choice of the stabilisation level is of major importance:* The difference in reductions between stabilisation targets (450, 550 and 650 ppmv CO_2eq.) is usually larger than the difference between the various approaches aiming at one stabilisation target for most countries.
- *Differences between approaches are small:* For most countries the differences in emission allowances between different approaches is relatively small compared to the overall reduction effort, especially in the long term. For some developed countries the difference may be larger, because of specific national circumstances. For some developing countries it may be larger because they participate early under one approach and much later under another approach.
- *The starting point in 2010 is of major importance for Annex I countries:* We assumed here that Annex I countries' future targets are based on their Kyoto targets in 2010. Exceptions are made for the USA with their national target (assumed here to be 23% above 1990 level) and for the economies in transition with their reference emissions in 2010 (below the Kyoto target). This ultimately political decision influences the results more for these countries than the choice of the future approach.
- *Only a compromise approach can be equally appealing to all countries:* We tested several approaches varying from very simple (equal percentage reduction) to very complex (Triptych or sectoral approach). Each approach is more attractive for some and less attractive for others. A simple approach can therefore only act as a general guide of direction, but the final agreement is likely to be based on a complex formula or ultimately a compromise. The multistage approach provides the opportunity to accommodate many ideas into a compromise.

The final agreement on an international climate change regime will be a multi-faceted, multi-staged or multi-layered system arising from an iterative process of countries proposing and assessing each others proposals. The data provided in this report intends to provide some insights to guide countries in such a process.

Contents

1. INTRODUCTION

The objective of this report is to provide an analytical basis to underpin discussions on future commitments to reduce greenhouse gas (GHG) emissions at the end of the first Kyoto Protocol commitment period (i.e. post-2012). The report is an update of the first version published 23 October 2006.

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The international climate negotiations are based on the principle of consensus. Therefore reliable and publicly available data on the situation of each country is of vital importance to the success of the negotiations to help delegations make informed decisions.

Three kinds of data are relevant in this context:

1. The description of the current status and likely future trends of countries;
2. The potential and costs to reduce emissions below likely future trends; and
3. The implications of possible future international climate regimes

Several institutions have already started to collect data relevant to the negotiations with respect to the current situation and trends (1). The United Nations Framework Convention on Climate Change (UNFCCC) publishes the national communications and GHG inventories of all countries that report them. The International Energy Agency (IEA) provides energy and GHG emission data it collects and calculates. IEA also publishes projections and forecasts of energy and GHG emissions data as well as a database on policies and measures to reduce greenhouse gas emissions. The World Resources Institute collects a wealth of information on a country by country basis from various sources in its Climate Indicator Analysis Tool (http://cait.wri.org). Meinshausen (2004) provided detailed emissions, target and projections of Annex I countries. Höhne, Wartmann et al. (2005b) provided "climate score cards" with data and an assessment on the climate performance of the G8 countries and five major developing countries.

For a description of the current situation and future trends for countries (1) the task at hand for this project is to package, synthesise and interpret the available information from the various sources so that it can be useful for policy makers. Within this project, we collected key data in spreadsheets and presented it in "fact sheets" for 60 countries (see Section 2).

Far less complete information is available on a country level when it comes to assessing the potential and costs of reducing emissions (2). Detailed analyses are available for European countries and other developed countries. But for most developing countries such mitigation analysis is either incomplete or has not been performed. All global models that consider GHG mitigation operate on a regional basis and not on country level.

For the potential and costs to reduce emissions below likely future trends, some information can be collected, but for most countries new analysis would be necessary to have sufficient information. The fact sheets of this project (Section 2) include some but incomplete data on potentials and costs.

For the last part, the implications of possible future international climate regimes (3), detailed studies on a country level globally have only been performed by Ecofys and later by RIVM. Ecofys provided, with the Evolution of Commitments model (EVOC), emission allowances of various approaches but did not provide costs. Country level analysis is limited since a consistent global dataset for baseline developments per country is not available. We are currently developing detailed baselines and cost estimates for European countries. RIVM uses the FAIR model (www.mnp.nl/fair) to calculate emission allowances on a country level and is currently developing costs per country. Other models have provided

[1] Links to various processes can be found at the "future international action on climate change network" www.fiacc.net

analysis on a regional level (up to 30 global regions) or considered only subgroups of countries (e.g. the EU Member States).

For the implications of possible future international climate regimes on these countries, the currently available tools need to be applied for specific assumptions on the future regime. The analysis of the country specific costs is limited. The implications of possible future climate regimes on emission allowances for countries are presented in section 3. It provides global scenarios as well as a sensitivity analysis for different methods to share emission allowances between Annex I countries.

Finally, Section 4 provides a discussion on the implications for Brazil, China, EU 25, India, Japan, Mexico, Russia, South Africa, South Korea and USA. The report closes with general conclusions in Section 5.

This version of the report includes the following changes compared to the earlier version published 23 October 2006:

- Additional fact sheets for 13 countries to cover all EU Member States and further developing countries;
- Additional information in the fact sheets on historical responsibility, access to electricity, energy efficiency in industry and mitigation costs;
- A summary of goals and targets that countries have already committed to; and
- Additional sensitivity analysis for sharing emission allowances among Annex I countries for a group reduction to 30% below the 1990 level 2020.

2. CURRENT SITUATION, TRENDS AND PROJECTIONS PER COUNTRY – FACT SHEETS

2.1 INTRODUCTION

Countries vary substantially in their national circumstances, including emission profiles, energy use and action against climate change. Much of the data on these national circumstances are available but spread over various sources.

Within this project, we developed fact sheets presenting historical trends, the current situation and projections to 2020 for 60 countries (Appendix A). Each fact sheet is accompanied by an electronic spreadsheet with further data in table format for more detailed analysis.

The fact sheets provide a ready overview of a number of important national circumstances, characteristics and trends for negotiations on post-2012 climate change regimes in a common format. The information should facilitate the negotiations process by providing insight into the background of key negotiation partners and allowing for a better assessment of the acceptability of specific proposals of certain partners.

The 60 countries which were selected on the basis of the following criteria:

- The largest Annex I countries
- All EU member states
- The largest developing countries
- A number of additional countries that have been or are expected to be active in the negotiations.

The following countries are included:

Argentina	China	France	Ireland
Australia	Columbia	Germany	Italy
Austria	Croatia	Greece	Japan
Belarus	Cyprus	Hungary	Kazakhstan
Belgium	Czech Republic	Iceland	Korea (South)
Brazil	Denmark	India	Latvia
Bulgaria	Estonia	Indonesia	Liechtenstein
Canada	Finland	Iran	Lithuania

Luxembourg	Norway	Slovakia	Ukraine
Malaysia	Pakistan	Slovenia	United Kingdom
Malta	Papua New Guinea	South Africa	United States of America
Mexico	Poland	Spain	
Monaco	Portugal	Sweden	Venezuela
Netherlands	Romania	Switzerland	
New Zealand	Russian Federation	Thailand	
Nigeria	Saudi Arabia	Turkey	

Data has been gathered from a hierarchy of sources, with the preference for formally accepted data such as from governments (e.g. National Communications or emission inventories submitted to the UNFCCC). Further sources are data from recognized international sources such as the IEA or the World Bank. If such data were not available or incomplete, other sources have been used, e.g. for policies and measures. More detailed definitions, sources, comments and caveats can be found in the fact sheet notes page at the end of Appendix A.

Figure 1 shows an example of a fact sheet, divided into 5 main sections:

- Economy-wide indicators
- Sectoral indicators
- Energy investments
- Policies & measures
- Overall summary

Here, we will briefly explain the various sections of the fact sheets by row, referring to the numbers indicated in the left-hand side of Figure 1.

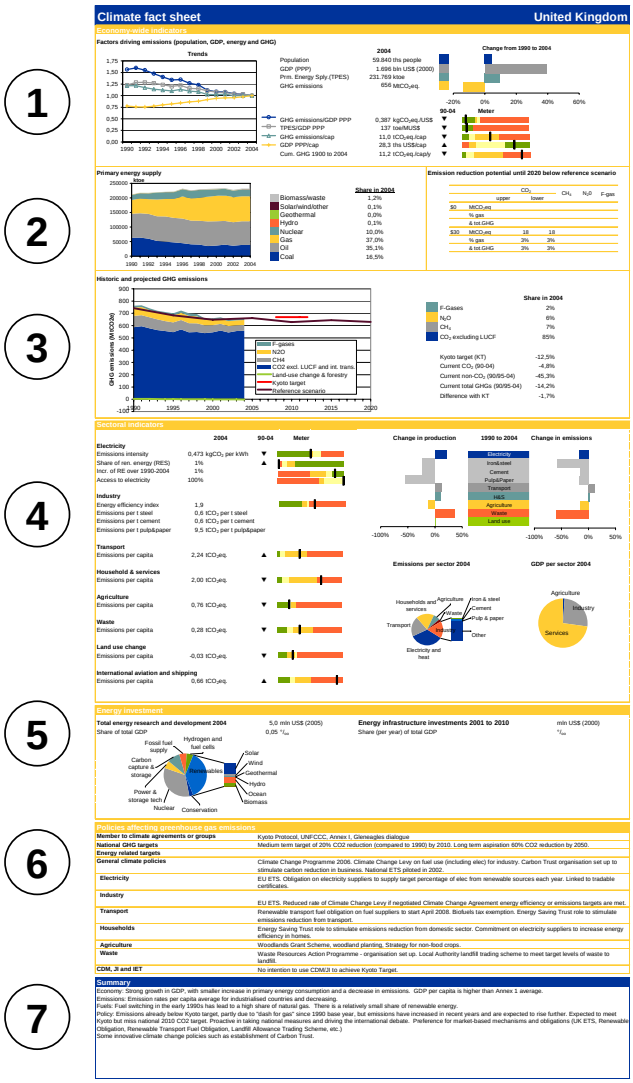


Figure 1. Structure of the fact sheets. Numbers refer to explanation of the various parts in the main text.

2.2 ECONOMY-WIDE INDICATORS

The economy-wide indicators include relevant information on GHG emissions, both historical emissions by gas, projected emissions and the progress towards the Kyoto target where applicable. Also shown are underlying trends in important drivers for those emissions:

- Energy consumption – split up into the different energy sources
- Gross domestic product (GDP) on a purchasing power parity (PPP) basis
- Population

To increase the understanding and cross-country comparability of these drivers, both absolute numbers for 2004 and the trends between 1990 and 2004 are shown along with the following indices:

- GHG emissions per unit of GDP – carbon intensity of the economy (reflecting the net effect of the energy intensity of the economy and the fuel mix)
- Total primary energy supply (TPES) per unit of GDP – energy intensity of the economy (reflecting the net effect of economic structure and energy efficiency)

- GHG emissions per capita (reflecting the net effect of energy intensity, fuel mix and welfare levels)
- GDP per capita (reflecting the welfare level)
- Cumulative greenhouse gas emissions from 1900 to 2004 divided by 2004 population

Historical greenhouse gas emission data have been collected by country, by gas and by sector from the following sources according to the following hierarchy:

1. National submissions to the UNFCCC as collected by the UNFCCC secretariat and published in the GHG emission database available at their web site. For Annex I countries the latest available year is usually 2004. Most non-Annex I countries report only or until 1994 (UNFCCC 2005)
2. $_{CO2}$ emissions from fuel combustion as published by the IEA (2005a). The latest available year is 2003
3. Emissions from land-use change as published by Houghton in the WRI climate indicator analysis tool (Houghton 2003)
4. Emissions from methane (CH_4) and nitrous oxide (N_2O) as estimated by the US Environmental Protection Agency. Latest available year is 2005 (USEPA 2006a)
5. CO_2, CH_4, N_2O, hydrofluorocarbons (HFCs), perfluorocarbons (PFC) and sulphur hexafluoride (SF_6) emissions from the EDGAR database version 3.2[2] available for 1990 and 1995 (Olivier and Berdowski 2001)

Emission projections for CO_2 have been taken from National Communications, the "with implemented measures" scenario. Where not available, they were taken from the World Energy Outlook of the IEA (IEA 2004) as provided in the CAIT tool (WRI 2006). Projections of Non-CO_2 gases were taken from USEPA 2006a. More detail on the approach to consolidate data and fill in gaps can be found at the end of Appendix A.

The top row of the economy-wide indicators (Row 1 of Figure 1) shows, on the right, the change in population, GDP, TPES and GHG emissions between 1990 and 2004. The absolute value for each of these four quantities in the most recent year available (2004) is given in the top middle of Row 1. The bottom middle of Row 1 shows five indices – GHG emissions per unit of GDP, total primary energy supply per unit of GDP, GHG emissions per capita, GDP per capita and cumulative emissions per capita for 2004. The left-hand side shows trends in these indices between 1990 and 2004 relative to their 2004 value to allow for comparison across quantities and to identify potential decoupling of trends.

The bottom right-hand side of Row 1 shows a 'performance meter', comparing the country's performance to that of other countries for each of the four indicators. In general, the borders between the colours represent the non-Annex I average, world average and Annex I average (see Figure 2). As there are always small countries that are outliers at the top or bottom of the range (e.g. per capita emissions of Trinidad and Tobago are extremely high), we selected the upper boundary of the meter to exclude the top 2.5% of the population. Similarly the lower boundary excluded the bottom 2.5% of population.[3] Hence, the full range of the meter includes 95% of the population. When a country's indicator is outside of this range, the bar will be displayed outside of the scale, but the distance to the scale is no longer proportional to it. The scale of the meters is linear. Values for the meters are given in Table 1.

[2] Emission Database for Global Atmospheric Research provided by the Netherlands Environmental Assessment Agency (MNP)

[3] The population figures of all countries are added, starting with the country having the highest (lowest) indicator value, e.g. Emissions per kWh. The cumulation of the population figures is stopped when 2.5 of the population with the highest (lowest) values are added up. The highest (lowest) value for the meter, then, is the one of the threshold country.

Table 1. Calibration of the performance meters

Indicator	Unit	Minimum (excluding lowest 2.5% of population)	Non-Annex I average	World average	Annex I average	Maximum (excluding highest 2.5% of population)
GHG emissions/GDP	$kgCO_2eq./US$	0.30	*0.72*	0.65	*0.60*	1.85
TPES/GDP	toe/MUS$	91.17	*202.75*	202.36	*200.87*	756.89
GHG emissions/cap	$tCO_2eq./cap$	0.50	3.09	5.32	14.14	25.41
GDP PPP/cap	ths US$/cap	0.71	4.32	8.14	23.39	36.43
Cumulative emissions from 1900 to 2004 per capita and year	$tCO_2eq./cap/year$	0.2	1.0	2.3	7.7	12.7
Emissions per kWh	$kgCO_2$ / kWh	0.01	*0.62*	0.51	*0.46*	0.93
Share in renewable energy (RE)	%	1%	*23%*	13%	*6%*	91%
Increase of RE over 1990-2004	%	-17%	-6.9%	-2.0%	-0.2%	3%
Share of population with access to electricity	%	5%	66%	72%	100%	100%
Energy efficiency index	No unit	1.2	*1.79*	1.75	*1.64*	2.5
Emissions from transport per capita	$tCO_2eq.$	0.02	0.32	0.85	2.93	6.36
Emissions from households and services per capita	$tCO_2eq.$	0.03	0.27	0.57	1.80	2.91
Emissions from agriculture per capita	$tCO_2eq.$	0.20	0.79	0.83	1.04	3.11
Emissions from waste per capita	$tCO_2eq.$	0.02	0.14	0.20	0.43	0.76
Emissions from land use change and forestry per capita	$tCO_2eq.$	-2.62	*0.63*	0.33	*-0.89*	8.69
Emissions from international aviation and shipping per capita	$tCO_2eq.$	0.00	0.14	0.19	0.37	0.72

Note: Usually the Annex I average is above the world average and the non-Annex I average is below the world average. When this is not the case, values are shown here in *italics* and the order of Annex I and non-Annex I averages (and the corresponding colours) in the meters are swapped.

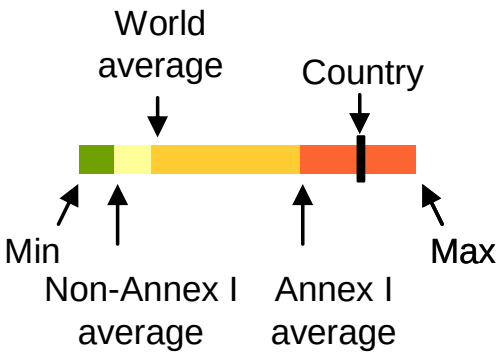


Figure 2. Calibration of performance meters

The left-hand side of Row 2 of Figure 1 shows the development of total primary energy supply between 1990 and 2004, with the contribution of different energy sources (IEA 2005b). The middle part lists percentage contribution of each of the energy sources to the TPES in 2004.

The right-hand side of Row 2 shows the emission reduction potential for different greenhouse gases in 2020 (compared to a reference scenario). Shown are the abatement potential at cost at 0 US dollars per tonne carbon dioxide equivalent (US$ (2000)/tCO_2eq.) and at 30$/t$CO_2$eq. Values are given for absolute reductions in million tonnes (Mt) CO_2eq., relative to the reference emissions of the gas and relative to the total GHG reference emissions. Data on non-CO_2 emissions are takien from US EPA/EMF (USEPA 2006a). For CO_2, no data have been included at this stage.

Row 3 of Figure 1 shows historical and projected GHG emissions and (progress towards) GHG targets. The left-hand side of Row 3 shows historical emissions by gas (excluding land-use, land-use change and forestry – LULUCF and excluding emissions from international transport), as well as the projected emissions according to a reference scenario. The Kyoto target is also shown in the graph where applicable. The effect of LULUCF is shown as a separate line. The right-hand side of Row 3 shows the relative contribution of the different gases to total emissions (excluding LULUCF) in 2004. The bottom right-hand side of Row 3 lists the Kyoto target and shows current (2004) progress towards the target for all GHGs as well as the change in CO_2 and non-CO_2 GHGs between base year and 2004.

2.3 SECTORAL INDICATORS

Row 4 of Figure 1 presents background information and drivers of emissions at a sectoral level. The left-hand side of Row 4 shows a performance indicator for each of the sectors (electricity, industry, transport, households & services, agriculture, waste, land-use change, and international aviation and shipping). In most cases the indicator is emission intensity (i.e. per kilowatt-hours (kWh), per tonne of product) or per capita emissions. For the electricity sector, information on the share of and trend in renewables in electricity generation as well as the percentage of the population with access to electricity is included. For the industry sector, indicators for a number of important sub-sectors are shown. The selection of sub-sectors has been determined by the data availability for the indicators chosen. Data on carbon intensity for other sectors are not available for a sufficient number of countries to include them here. We have, however, included an aggregated energy efficiency index for industry. This index is 1, if a country uses best available technology. An index 1.2 indicates that the country uses 20% more energy than necessary under best practice. Shown are the values for each of the sectoral performance indicators in 2004, the trend between 1990 and 2004 (increasing or decreasing) and a 'performance meter', comparing the country's performance to that of other countries.

The top right-hand side of Row 4 shows the trends in production (or activity) for each of the sectors between 1990 and 2004 and compares this with the trends in emissions over the same period. Again, this allows for the identification of potential decoupling of trends. The bottom right-hand side of Row 4 shows the importance of the different sectors in terms of contribution to total GDP and total GHG emissions in the most recent year available (2004). As emissions from land-use change and forestry can also be negative, emissions from this sector are excluded from this graph.

2.4 ENERGY INVESTMENTS

Row 5 of Figure 1 shows information about countries' investment into energy infrastructure and energy R&D (both based on IEA data). The left-hand side of Row 5 shows total public (not private) funding for energy research and development in 2004 and indicates what this represents as a share of national GDP. The graph shows the breakdown of energy R&D investment into the various categories, distinguishing between:

- Renewables (split up by type)
- Conservation
- Nuclear (fusion and fission)
- Power and storage technologies
- Other technology and research
- Carbon capture and storage
- Fossil fuel supply
- Hydrogen and fuel cells

The right-hand side of Row 5 shows similar data for the investment in energy infrastructure, distinguishing:

- Electricity generation (excluding renewables)
- Renewables
- Coal
- Oil
- Gas

Infrastructure investment data are shown for the current decade, taking into account projects that have already been decided and expenditures that have already incurred. The convention of attributing capital expenditures to the year in which the plant in question becomes operational has been adopted (i.e. no attempt has been made to estimate the lead times for each category of project). Investment is defined as capital expenditure only and does not include spending that is usually classified as operation and maintenance. Only those government policies and measures that had been enacted as of mid-2002 are taken into account and later or potential policy initiatives (including those aimed at reducing greenhouse gas emissions and energy imports) are not taken into account. Note that supply side investments only are considered.

For the oil sector, investments included are exploration and development, refining, tankers, pipelines and non-conventional oil production facilities. For the gas sector, investments included are exploration and development, liquefied natural gas facilities, transmission and distribution pipelines and underground storage facilities. For the coal sector, investments included are mining, shipping and ports. For the electricity generation sector, investments included are power stations and transmission and distribution networks for the electricity sector (excluding renewables but including nuclear power). Electricity includes the total amount of electricity generated by power plants and own-use and transmission and distribution losses. Renewables include geothermal, wind, wave, tidal, hydropower, biomass, and biofuels and hydrogen derived from renewable resources. Advanced technologies such as carbon storage and hydrogen production are not included.

2.5 POLICIES & MEASURES

Row 6 of Figure 1, on policies and measures identifies the climate change agreements the country has signed up to (UNFCCC, Kyoto Protocol, Asia-Pacific Partnership (AP6)), as well as memberships in certain groups or coalitions (Gleneagles Dialogue, OPEC, G77 & China, Aosis). For each of the sectors identified in the previous section a short description of some main climate change policies and measures are described. In addition, an indication is given of the intention of the country to participate in Kyoto mechanisms (mainly Joint Implementation (JI) and Clean Development Mechanism (CDM)).

2.6 SUMMARY OF COMMITMENT TYPES

The summary (Row 7 of Figure 1) aims to capture the most important messages from the data presented in the previous sections. This includes progress towards targets, clear trends in fuel switch, intensity changes, economic and structural changes and population trends. In addition, any remarkable observations regarding other indicators or policies are presented.

A summary of different types of already existing targets and commitments per country is included separately in Appendix B. Information for 41 countries is available on voluntary greenhouse gas targets as well as targets on renewable energy, biofuels, energy efficiency, waste, energy intensity, and emission trading.

3. IMPLICATIONS OF FUTURE CLIMATE REGIME ARCHITECTURES

In this section, we assess the implications that different future climate change regime architectures will have on countries' emission allowances. Three levels of ambition were explored – stabilising greenhouse gas concentrations at 450, 550 and 650 parts per million by volume carbon dioxide equivalent (ppmv

CO_2eq.). We consider the years 2020 (short term) and 2050 (long term) to evaluate the emission reductions that will be necessary to meet these stabilisation levels around the end of the century. Section 3.1 describes the global emission levels needed to reach stabilisation.

The global approaches modelled are described in Section 3.2. This section provides required emission reductions for the different (groups of) countries according to the considered approaches. For all approaches we have kept the global emission level constant and therefore shifted the level of emission allowances between all different countries (see Figure 3). In Section 3.3 we provide a sensitivity analysis for the different options to share emission allowances between Annex I countries. Here the emission level of the group of Annex I countries is kept constant and the level of emission allowances between Annex I countries is shifted.

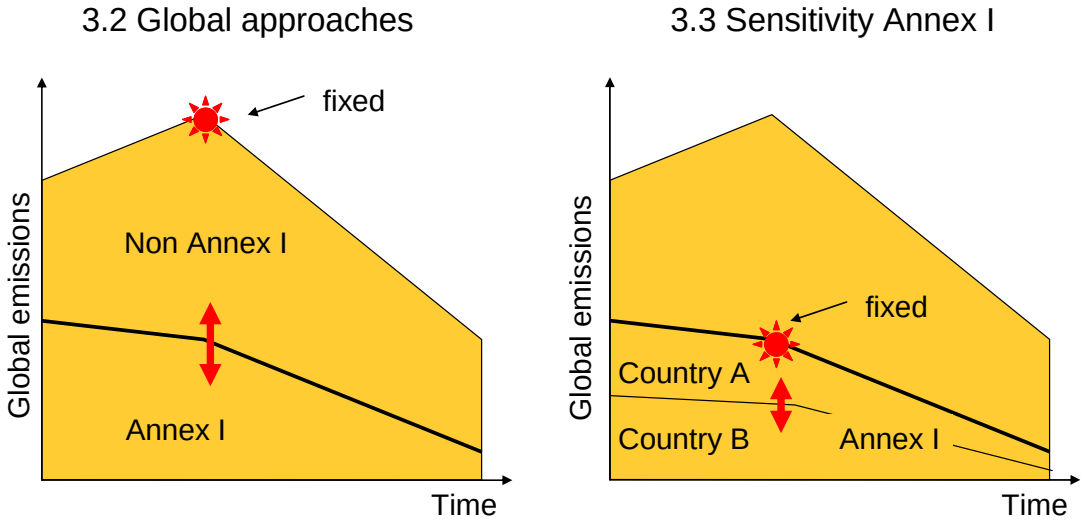


Figure 3. Methodological approach used in Section 3.2 and 3.3

3.1 EMISSION CORRIDORS TOWARDS STABILISATION

Stabilisation of atmospheric GHG concentrations during the 21st century at any of the three levels will require a significant departure from current emission trends. Global emissions will need to decline significantly compared to today; dropping below emissions in 1990 and declining to almost zero over time. The earlier the emissions peak and decline, the lower will be the stabilised concentration level, leading to a lower level of climate change impacts.

To achieve stabilisation of atmospheric GHG concentrations, CO_2 as well as other greenhouse gases, such as methane (CH_4) and nitrous oxide (N_2O), should be included. Since the industrial revolution, anthropogenic emissions have increased the atmospheric CO_2 concentration from 280 ppmv to the current level of around 380 ppmv. The effect of different greenhouse gases is compared using their radiative forcing, i.e. the amount of radiation (heat) trapped by the gas measured in watts per square metre (W/m²). Current atmospheric concentration of the three main GHGs, CO_2, CH_4 and N_2O produce a combined radiative forcing that is approximately equivalent to the forcing of CO_2 alone at a concentration of 422 ppmv (i.e. 422 ppmv CO_2eq. accounting for different global warming potentials). Stabilising the CO_2 concentration at 450 ppmv and reducing emissions of the other gases at similar rates would lead to a combined radiative forcing equivalent to that of 550 ppmv CO_2 (450 ppmv CO_2 ~ 550 ppmv CO_2eq.) (Eickhout et al. 2003). Similarly 400 ppmv CO_2 corresponds to 450 ppmv CO_2eq. and 550 ppmv CO_2 corresponds to 650 ppmv CO_2eq.

The Council of Ministers of the European Union agreed in June 1996 that “global average temperatures should not exceed 2°C above pre-industrial level and that therefore concentration levels lower than 550 ppmv CO_2 should guide global limitation and reduction efforts” (EU Council 1996). The European Union

and several European ministers have repeatedly committed to the 2°C temperature target. The translation of change in atmospheric greenhouse gas concentrations to change in temperature involves the relatively large uncertainty of the climate sensitivity (the equilibrium change in global mean surface temperature following a doubling of the atmospheric CO_2 (equivalent) concentration). The IPCC Fourth Assessment Report (IPCC 2007b) suggested that climate sensitivity is likely to be in the range of 2°C to 4.5°C. At average climate sensitivity, the EU has to aim for a CO_2 concentration below 450 ppmv (i.e. 550 CO_2eq.) to achieve the 2°C target. Using various probability distributions of the climate sensitivity, Hare and Meinshausen (2004; Meinshausen 2005) conclude that it is "unlikely" that the 2°C will be met (70%-100% risk of stabilizing above) with stabilisation of at 550 ppmv CO_2eq. (450 ppmv CO_2 only). They deduce further that there is roughly a 50/50 chance that it is met at 450 ppmv CO_2eq. (400 ppmv CO_2 only); and that it is "likely" to be met (2% to 55% risk of stabilizing above) at 400 ppmv CO_2eq. (370 ppmv CO_2 only), which is already exceeded today.

Figure 4 describes possible ways of development of GHG emissions between 1990 and 2050. The figure includes a business-as-usual scenario (BAU) and three emission reduction scenarios. Under the BAU scenario no special emission reduction efforts are assumed for the future. The three emission reduction scenarios shall illustrate which global emission reduction efforts would be needed compared to the BAU case to reach different emission stabilisation levels. In this context, *emission pathways* describe the annual global emission level for some time period. For example a possible emissions pathway may be that global emissions increase rapidly, peak and then decrease rapidly. An *emissions corridor* is a range of emissions pathways which lead to a particular stabilisation level; for example the emissions pathway just described and one in which global emissions increase slowly and then decrease slowly may lead to the same concentration level by the end of the century. Figure 4 illustrates possible global CO_2 emission pathways until 2050 and covers reference emissions as well as the emissions corridors needed to achieve the three global emission stabilisation levels of 400, 450 and 550 ppmv CO_2 selected for this analysis.

The long residence time of CO_2 in the atmosphere (in the order of 100 years) means that to the first approximation, the cumulative emissions, irrespective of the time of emission, define the concentration level. This means that many alternative pathways are permitted which may have significant differences in the timing of required emission reductions. Therefore, the spread of emissions pathways that lead to the same concentration levels can be large.

Figure 4 (top left) provides an overview of historical emissions, the range of future global CO_2 emissions as adapted from the standard set of emissions scenarios of the Special Report on Emission Scenarios (SRES) of the IPCC (Nakicenovic et al. 2000) as presented by Höhne (2006). A substantial spread of possible future emissions is apparent in the next few decades. The figure also shows a 450 ppmv CO_2 emission corridor derived using a simple climate model and two simple assumptions: annual global emissions cannot decrease more than 3% per year and the annual trend cannot change more than 0.5 percentage points per year (Höhne 2006). The corridor includes two example pathways: One where global emissions increase rapidly, peak and then decrease rapidly and one where emissions decrease moderately from the start. Both paths lead to the same concentration level by the end of the century.

Figure 4 (top right) shows the range of possible global CO_2 emission corridors that lead to stabilisation levels of 400 and 550 ppmv CO_2 according to the same simple assumptions (Höhne 2006).

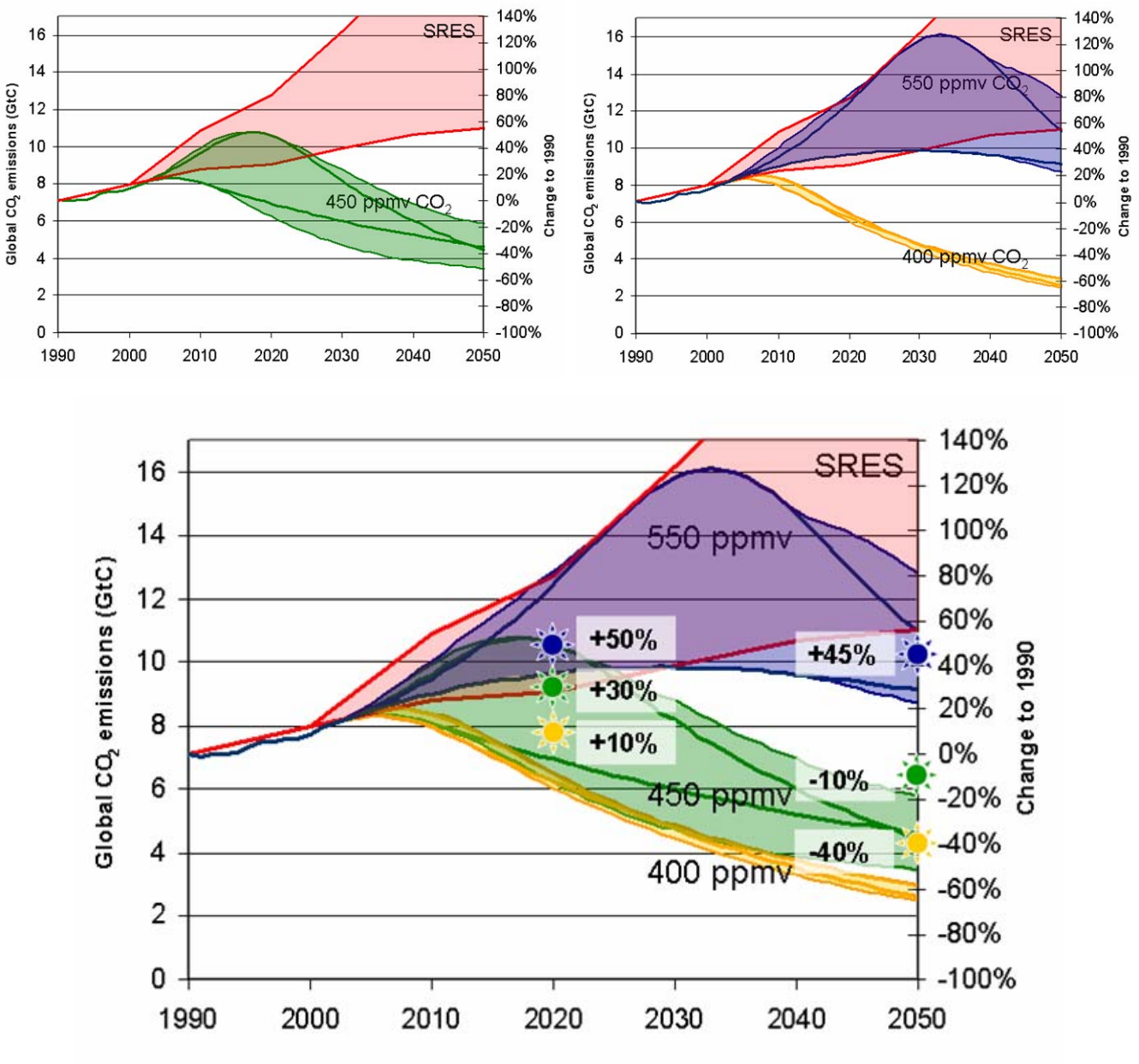


Figure 4. Possible global CO_2 emission pathways until 2050: Reference emissions and emissions corridor towards stabilisation at 450 ppmv CO_2 (550 ppmv CO_2eq.) (top left); reference emissions, emissions corridor towards 550 ppmv CO_2 (650 ppmv CO_2eq.) and emissions corridor towards 400 ppmv CO_2 (450 ppmv CO_2eq.) (top right); and selected global emission levels for 2020 and 2050 relative to 1990 for this analysis (emission pathways and corridors according to Höhne (2006))

Figure 4 (bottom) shows the summary of all three stabilisation corridors and the SRES reference scenario. In addition we included six reference points (for 2020 and 2050 and for each stabilisation level), which have to be met in all calculations in Section 3.2.

The reference points are based on a review of recent literature (den Elzen and Meinshausen 2005; Höhne et al. 2005a; Höhne and Blok 2006; IPCC 2007a) (see Appendix E). The values for 400 ppmv CO_2 (2020, 2050) and for 450 ppmv CO_2 (2050) do not correspond completely to the given emission reduction corridors in Figure 4. The reason for that is that the shown reduction pathways only reflect one scenario

set presented by Höhne (2006), which is based on simple assumptions and only CO_2. For the choice of the reference points we considered a larger set of sources (Appendix E), which however do not provide such illustrative corridors.

Figure 4 provides only CO_2 emissions, but other greenhouse gases are also important. For this analysis it is assumed that for a given concentration level, emissions of the non-CO_2 gases need to be reduced by the same percentage as the CO_2 emissions. We assumed here for the case towards 550 ppmv CO_2 that global greenhouse gas emissions, weighted with global warming potentials, can be 50% above the 1990 level in 2020 and 45% above the 1990 level in 2050. For the 450 ppmv CO_2 case it would be +30% in 2020 and -10% in 2050. For the 400 ppmv CO_2 case it would be +10% in 2020 and -40% in 2050 (see Table 2).

Table 2. Possible emission reduction pathways and global emissions reference points for the different global emission stabilisation levels as used in this report

	Emission level in ppmv		Reduction compared to 1990	
	CO_2	~CO_2eq.	2020	2050
	550	650	+50%	+45%
	450	550	+30%	-10%
	400	450	+10%	-40%

Two different ways are possible to reach a stable concentration level (see Figure 5): The concentration level can approach the target from below, always staying lower than the target level (dashed blue path). The second possibility is that the concentration level exceeds the target level followed by a decline (red solid line, “overshooting”). However, the final emission level can be similar in both cases. The possibility of overshooting is sometimes considered in literature (e.g. den Elzen and Meinshausen 2005), in some cases it is excluded (e.g. Höhne et al. 2005a).

The reduction pathways in Table 2, could imply temporary overshooting for early years and low stabilisation levels. Overshooting is possible for the 2020 reference point to reach 400 ppmv CO_2, but it is unlikely for the 2020 reference point to reach 450 ppmv CO_2. For all other reference points overshooting is not considered.

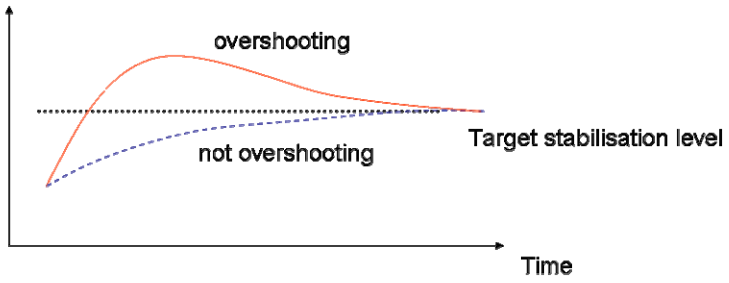


Figure 5. Reduction paths including and excluding overshooting of the global emission level

3.2 FUTURE GLOBAL APPROACHES FOR ALLOCATION OF EMISSION ALLOWANCES

This section presents emission allowances for seven possible future architectures consistent with emission pathways towards 450, 550 and 650 ppmv CO_2eq. for the years 2020 and 2050. This means that the calculation outcomes have to meet the global emissions reference points mentioned above. The following approaches are included in the calculation of emission allowances:

- Contraction and convergence by 2050
- Common but differentiated convergence
- Multistage
- Global Triptych
- Sectoral approach
- GHG intensity targets for all countries

For this comparison of future architectures the Evolution of Commitments tool (EVOC) is used. A detailed description of the EVOC model is included in Appendix C.

3.2.1 Contraction and convergence by 2050

Under Contraction and convergence (C&C) (Meyer 2000; GCI 2005), all countries participate in the regime with quantified emission targets. As a first step, all countries agree on a path of future global emissions that leads to an agreed long-term stabilisation level for greenhouse gas concentrations ('Contraction'). As a second step, the targets for individual countries are set in such a way that per capita emissions converge from the countries' current levels to a level equal for all countries within a given period ('Convergence'). The convergence level is calculated such that resulting global emissions follow the agreed global emission path. The resulting convergence levels for this report are given in Table 3. It might be more difficult for some countries to reduce emissions compared to others, e.g. due to climatic conditions or resource availability. Therefore, emission trading could be allowed to level off differences between allowances and actual emissions. However, C&C does not explicitly provide for emission trading.

As current per capita emissions differ greatly between countries some developing countries with very low per capita emissions, (e.g. India, Indonesia or the Philippines) could be allocated more emission allowances than necessary to cover their emissions ("hot air"). This would generate a flow of resources from developed to developing countries if these emission allowances are traded.

For a stabilisation at about 650 ppmv CO_2eq. a convergence at about 4 to 5 tCO_2eq. per capita in 2050 is necessary (see Table 3). In this case the average per capita emissions lie around 6 tCO_2eq. per capita in 2020. For a stabilisation at about 550 ppmv CO_2eq. in 2050 a convergence at about 3 tCO_2 per capita with average per capita emissions of about 5 tCO_2eq. in 2020 is required. To reach a stabilisation at about 450 ppmv CO_2eq. a convergence at about 2 tCO_2 per capita is necessary. In this case average per capita emissions in 2020 around 4 tCO_2 per capita are needed.

Table 3. Convergence level of per capita emissions in tCO_2eq./cap for the considered SRES scenarios in 2050

Scenario	450 ppmv CO_2eq.	550 ppmv CO_2eq.	650 ppmv CO_2eq.
A1, B1	2.1	3.2	5.1
A2	1.6	2.5	4.0
B2	2.0	2.9	4.8

Under relatively strict long-term targets (e.g. 450 ppmv CO_2eq.) and convergence by, e.g., 2050, also several developing countries would have to reduce their emissions compared to the BAU; as the per capita emissions have to converge to a level below current average of developing countries, those developing countries above or close to the average (e.g. Argentina, Brazil, Venezuela, Mexico, South Africa, South Korea, Namibia, Thailand, China) will soon (e.g. 2020) be constrained and will not receive excess allowances. More excess allowances would be available under a higher concentration target, e.g. 550 ppmv CO_2, or under earlier convergence, e.g. by 2030. The later the convergence year, the higher is the contribution of developing countries because late convergence years require low emission levels. These would lead to a smooth convergence path for many developing countries. For convergence in earlier years higher, above developing country average conversion levels would be needed. This would allow more space for initially increasing, peaking and then declining emissions of developing countries.

3.2.2 Common but differentiated convergence

Common but differentiated convergence (CDC) is a new approach presented by Höhne et al. (Höhne et al. 2006a). Annex I countries' per capita emission allowances converge within, e.g., 40 years (2010 to 2050) to an equal level for all countries. Individual non-Annex I countries' per capita emissions also converge within the same period to the same level but convergence starts from the date, when their per capita emissions reach a certain percentage threshold of the (gradually declining) global average. Non-Annex I countries that do not pass this percentage threshold do not have binding emission reduction

requirements. Either they take part in the CDM or they voluntarily take on positively binding emission reduction targets. Under the latter, emission allowances may be sold if the target is overachieved, but no emission allowances have to be bought if the target is not reached.

The CDC approach, similarly to C&C, aims at equal per capita allowances in the long run (see Figure 6). In contrast to C&C it considers more the historical responsibility of countries. Annex I countries would have to reduce emissions similarly to C&C, but many non-Annex I countries are likely to have more time to develop until they need to reduce emissions. Non-Annex I country participation is conditional to Annex I action through the gradually declining world average threshold. No excess emission allowances ("hot air") would be granted to least developed countries.

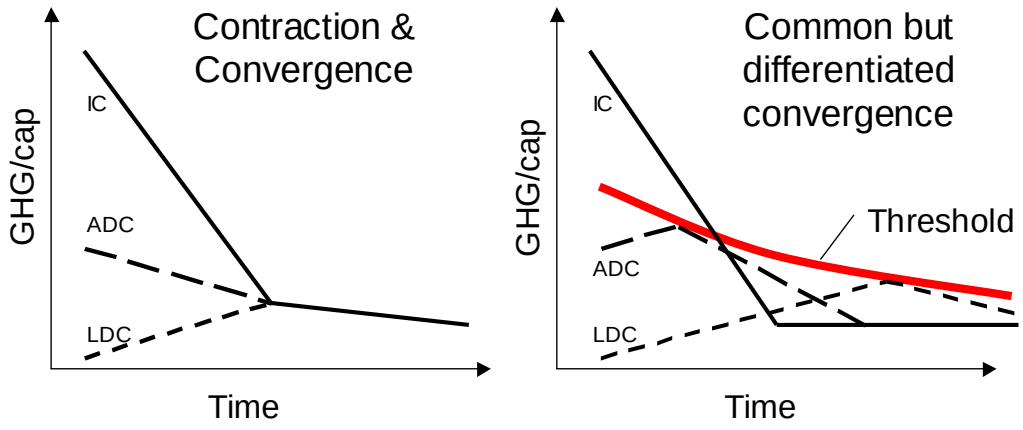


Figure 6. Schematic representation of GHG emissions per capita for three types of countries (an industrialized country (IC), an advanced developing country (ADC) and a least developed country (LDC)) under Contraction & Convergence (left) and under Common but Differentiated Convergence (right)

The parameters of the convergence time, the threshold for participation and the convergence level used in this report are provided in Table 4.

Table 4. Parameters used for the Common but Differentiated Convergence approach[4]

Parameter	Unit	450 ppmv CO_2eq.		550 ppmv CO_2eq.		650 ppmv CO_2eq.	
		2020	2050	2020	2050	2020	2050
Convergence time	Years	30	40	40	40	40	40
Threshold	% above or below world average	-55%	-30%	-10%	-5%	40%	23%
Convergence level	tCO_2eq./cap	1	1.8	2	2.6	8	4.5

3.2.3 Multistage

As the name suggests in a Multistage approach countries participate in several stages, with differentiated types and levels of commitments[5]. Each stage has stage-specific commitments with countries graduating

[4] It may not be possible to meet both reference points (for 2020 and 2050) per stabilisation level (450, 550 or 650 ppmv CO_2eq.) for one set of parameters. Different parameter configurations are necessary for each reference point. This means that the configurations e.g. for 2020 450 ppmv CO_2eq. are valid only until 2020. For long-term calculations (2050) other configurations are necessary which are valid only for 2050.

[5] E.g. Claussen and McNeilly 1998; Gupta 1998; Berk and den Elzen 2001; USEPA 2002; Blanchard et al. 2003; CAN 2003; Criqui et al. 2003; den Elzen et al. 2003; Gupta 2003; Höhne et al. 2003; Ott et al. 2004; Blok et al.

to higher stages when they exceed certain thresholds (e.g. emissions per capita or GDP per capita). All countries agree to have commitments at a later point in time. For this analysis thresholds based on per capita emissions with four stages were applied as follows (e.g. Höhne et al. 2005a):

- ***Stage 1 – No commitments:*** Countries with a low level of development do not have climate commitments. As a minimum all least developed countries (LDCs) would be in this stage. In the model countries in this stage follow their reference scenario as no emission reductions are required.
- ***Stage 2 – Enhanced sustainable development:*** At the next stage, countries commit in a clear way to sustainable development: The environmental objectives have to be built into the development policies. Such a first 'soft' stage would make it easier for new countries to join the regime. Requirements for such a sustainable pathway could be defined, e.g. inefficient equipment is phased out and requirements and certain standards are met for any new equipment, or there is a clear deviation from the current policies depending on the countries. This stage is implemented in the model by assuming countries reduce emissions by a percentage below their reference scenario within 10 years and then follow the reduced reference scenario.
- ***Stage 3 – Moderate absolute target:*** In this stage, countries commit to a moderate target on absolute emissions. The emission level may be higher than the starting year, but it should be below a reference scenario. The target could be positively binding, meaning that allowances can be sold if the target is exceeded but no allowances have to be bought if the target is not achieved. An incentive to accept such a target would be the possibility to participate in emissions trading. To model the group of countries in this stage, a percentage reduction below their reference scenario more stringent than in stage 2 is assumed.
- ***Stage 4 – Absolute reduction target:*** Countries in stage 4 receive absolute emission reduction targets and have to reduce their absolute emissions substantially until they reach a low per capita level (essentially a fifth stage). The whole group of countries reduces its emissions as a certain percentage compared to 1990. The actual contribution of each country depends on its per capita emissions. Countries with high emissions per capita have to reduce more than countries with low emissions per capita. As time progresses, more and more countries enter stage 4.

The parameters for reductions and stage participation thresholds chosen for the calculations are given in Table 5. The choice of parameter values is subjective but should reflect a reasonable burden sharing of emission reductions among developed and developing countries. Several other options are possible. Lower stage-thresholds, for example, would require higher contributions of developing countries.

2005; den Elzen 2005; den Elzen et al. 2005b; Höhne et al. 2005a; Höhne and Ullrich 2005; Michaelowa et al. 2005; den Elzen et al. 2006

Table 5. Parameters used for the Multistage approach [6]

Parameter	Unit	450 ppmv CO_2eq.		550 ppmv CO_2eq.		650 ppmv CO_2eq.	
		2020	2050	2020	2050	2020	2050
Threshold to enter stage 2	tCO_2eq./cap	3.5	2.5	5.0	3.0	6.0	4.0
Threshold to enter stage 3	tCO_2eq./cap	4.5	3.5	6.5	5.0	7.5	5.5
Threshold to enter stage 4 in 2010	tCO_2eq./cap	6.0	4.0	7.5	6.0	9.0	6.5
Threshold to enter stage 4 in 2100	tCO_2eq./cap	5.0	1.5	6.5	4.0	7.5	5.5
Threshold for no further reduction in stage 4	tCO_2eq./cap	1.5	1.0	2.0	1.5	5.0	5.0
Stage 2 (enhanced sustainable development) reduction below reference scenario in 10 years	%	15	25	15	20	5	15
Stage 3 (Moderate absolute target) reduction below reference scenario in 10 years	%	30	30	25	30	10	20
Stage 4 (Absolute reduction) reduction per year*	%	5.0	9.0	3.0	6.0	0.7	3.0

*The reduction percentages per year are applied to the absolute emissions in the previous year and therefore lead to an exponential decline in absolute emissions. Other slopes (e.g. linear) are possible.

The parameters in the 650 ppmv CO_2eq. case could have a realistic chance of being acceptable to many countries: The second stage (pledge for sustainable development) would require 5 to 15% reduction below the reference scenario, the third stage (moderate reductions) would require emission to be 10 to 20% below reference. Participation in stage 4 (absolute reduction target) would be at 9 tonne carbon dioxide equivalent per capita (tCO_2eq./cap), which is between current Annex I and world average. The reduction obligations would still be ambitious with 0.7 to 3% reduction per year.

The parameters for the 550 ppmv case are much more stringent: The second stage (pledge for sustainable development) would already require emissions to be reduced by 15 to 20% below reference; the third stage (moderate reductions) would require reductions of 25 to 30% below reference. Participation in stage 4 (substantial reductions) would be at about current world average. The reduction obligations would be ambitious with a 3 to 6% reduction per year.

The parameters needed for the 450 ppmv CO_2eq. case stretch the approach to its limits: participation in stages 2 and 3 has to occur almost immediately for most developing countries. Already in stages 2 and 3 reductions of 15 to 25% and 30% respectively have to occur. Countries at stage 4 have to reduce emissions drastically by 5% to 9% per year.

3.2.4 Global Triptych

This approach was originally developed at the University of Utrecht (Blok et al. 1997) to share the emission allowances of the first commitment period within the European Union. It has been updated and revised subsequently (Phylipsen et al. 1998, Groenenberg 2002, den Elzen and Lucas 2003, Höhne et al. 2003, Phylipsen et al. 2004, Höhne et al. 2005a, Höhne 2006).

Analogue to the first Triptych approach, the global Triptych approach is a method to allocate emission allowances among a group of countries based on several national indicators.[7] It takes into account main differences in national circumstances between countries that are relevant to emissions and emission reduction potentials. The Triptych approach as such does not define which countries should participate, but we have applied it here to all countries equally.

[6] It may not be possible to meet both reference points (for 2020 and 2050) per stabilisation level (450, 550 or 650 ppmv CO_2eq.) for one set of parameters. Different parameter configurations are necessary for each reference point. This means that the configurations e.g. for 2020 450 ppmv CO_2eq. are valid only until 2020. For long-term calculations (2050) other configurations are necessary which are valid only for 2050.

[7] Unlike e.g. the Multistage approach which is more a framework of stages that can be filled with different allocation methods for the several stages or C&C which is based only on per capita emissions.

If the approach is applied globally, substantial reductions for the industrialised countries, especially those with carbon intensive industries (i.e. Eastern Europe and Russian Federation), are required. Substantial emission increases are allowed for most developing countries. But for lower concentration targets (e.g. 450 ppmv CO_2) these are rarely above BAU-emissions.

The Triptych methodology calculates emission allowances for the various sectors which are added to obtain a national target. Not individual sector targets but only the national targets are binding. This provides countries the flexibility to pursue any cost-effective emission reduction strategy.

The emissions of the sectors are treated differently: For 'electricity production' and 'industrial production', a growth in the physical production is assumed together with an improvement in production efficiency. This takes into account the need for economic development but constant improvement of efficiency. For the 'domestic' sectors, convergence of per capita emissions is assumed. This takes into account the converging living standard of the countries. For the remaining sectors, 'fossil fuel production', 'agriculture' and 'waste', similar reduction and convergence rules are applied.

Table 6 provides the parameters chosen for the calculation in this report. Details on the applied methodology can be found in Phylipsen et al. 2004. The choice of parameter values is subjective but should reflect a reasonable burden sharing of emission reductions. Several other options are possible. We intended the chosen parameters to be balanced in stringency over the sectors for the stabilisation levels of 450 and 650 ppmv CO_2eq. For 550 ppmv CO_2eq. the chosen parameter set is valid for both years, 2020 and 2050, but does not allocate emission reduction efforts evenly over all sectors. The parameters for the 650 ppmv case are relatively moderate: 40% to 50% share of renewable and emission-free electricity in 2050, 20% to 40% reduction in electricity generation based on coal and oil as well as convergence of all countries' industrial energy efficiencies to a level that is 5% to 30% better than best available technology in 1995. The parameters for the 450 ppmv case stretch the methodology to the limit: 70% to 95% renewable and emission-free electricity in 2050, 70% to 95% reduction in electricity generation from coal and oil, convergence to an industrial energy efficiency that is 50% to 70% better than best available technology in 1995.

Table 6. Parameter choices for 2020 and 2050 for the Triptych cases aiming at 450, 550 and 650 ppmv CO_2eq. concentration

Sector	Quantity	450 ppmv		550 ppmv	650 ppmv	
		2020	2050	2020 + 2050	2020	2050
Industry	Maximum deviation of total industrial production at country level in 2050	45%	45%	45%	45%	45%
	Maximum deviation of total industrial production at global level in 2050	10%	10%	10%	10%	10%
	Convergence of Energy Efficiency Indicator in 2050	0.3	0.5	0.6	0.95	0.7
	Structural change factor	0.2	0.35	0.45	0.95	0.6
Electricity	Maximum deviation of total power production at country level in 2050	45%	45%	45%	45%	45%
	Maximum deviation of total power production at global level in 2050	10%	10%	10%	10%	10%
	Share of renewables and emission free fossil in 2050	95%	70%	60%	50%	40%
	Share of CHP in 2050	5%	20%	20%	20%	30%
	Reduction of solid fuels in 2050 compared to base year	95%	70%	50%	40%	20%
	Reduction of liquid fuels in 2050 compared to base year	95%	60%	60%	50%	30%
	Amount of nuclear energy	Absolute unchanged				
	Amount of natural gas	Remainder				
	Total efficiency of CHP	90%	90%	90%	90%	90%
	Convergence of power generation efficiency of solid fuels in 2050	50%	50%	50%	50%	50%
	Convergence of power generation efficiency of liquids fuels in 2050	55%	55%	55%	50%	50%
	Convergence of power generation efficiency of gas in 2050	70%	70%	65%	65%	65%
Domestic Sector	Domestic convergence level – per capita emissions in tCO_2/cap/yr in 2050	0.5	0.7	1	2.6	1.7
Fossil fuel production	Fossil fuel emission level – % total emissions below base year in 2050	90%	90%	90%	90%	90%
Agriculture	Reduction below reference scenario emissions in 2050 – low GDP/cap	70%	70%	50%	20%	20%
	Reduction below reference scenario emissions in 2050 – high GDP/cap	90%	80%	70%	40%	40%
Waste	Waste convergence level – per capita emissions in 2050	0	0	0	0	0

3.2.5 Sectoral approach

Different sectoral approaches are discussed actively in various international fora. Nevertheless, their exact specification, e.g. the actual implementation to reach stabilisation of the global emission level, is often unclear. The common goal of sectoral approaches is to reduce emissions while avoiding competitiveness concerns across countries by applying the same rules for a particular sector to all countries.

One option would be that the industry in one global sector would assume a target. For example, the automobile industry agrees to implement a standard for greenhouse gas emission per person kilometre. The responsibility to implement the target would be with the automobile industry and not with the national governments. All global automobile producers would be on the same level.

Another option is that the responsibility remains with national governments but that the same rules for one sector are applied to all countries. This could be an emission standard or benchmark for a particular sector described, e.g., in grams CO_2 per tonne of steel (gCO_2/t steel). The commitment would be the

implementation of the standard, not to reach a certain emission level and emission trading would not be possible. Such targets can also only be applied for a few sectors with defined products, such as iron and steel or cement. The difficulty for the sectoral approach is in the detail of, e.g., defining which products belong to the sector and which do not. In addition, it has to be ensured that all sectors are covered.

A further option would be that emission targets are defined for all individual sectors as function of their respective output (e.g. t of steel, kWh produced, etc.). Although the emission targets are defined for specific sectors, they can still be reached in a flexible manner across greenhouse gases and sectors as well as through emission trading. In this case the final allowable amount of emissions depends on the respective outputs in the target year.

This last option is further developed into a global regime by the Center for Clean Air Policy (CCAP) (Schmidt et al. 2006) and is used here. The CCAP proposes that Annex I countries would continue to receive absolute emission reduction targets. Key developing countries would pledge to achieve a voluntary sector "no lose" GHG intensity target (e.g., GHG / ton of steel) in major energy and heavy industry sectors (e.g. electricity, cement, steel, oil refining, pulp/paper, metals, etc). The inclusion of the top 10 largest GHG emitting developing countries in each sector would insure coverage of 80-90 percent of developing country GHG emissions in each of the selected sectors.

This approach was modelled with assumptions about the absolute reductions of Annex I countries and sectoral reductions of the major non-Annex I countries (Argentina, Brazil, China, Indonesia, India, Iran, Kazakhstan, Mexico, Saudi Arabia, South Africa, South Korea, Thailand).

This approach is modelled separately based on Höhne et al. (2006b) and not within the EVOC tool. Due to data limitations, in particular on growth rates of physical production, this approach was only modelled until 2020. Data are only available for 18 single countries, the EU 15 and the rest of the world as a whole. Therefore, the results of these calculations cannot be shown completely in the figures below but are included more detailed in Appendix D.

Table 7 includes the chosen parameters for this approach. Again, the choice of parameter values is subjective but should reflect a reasonable burden sharing of emission reductions among developed and developing countries. Several other options are possible. The sectoral approach is the only approach where we chose 650 ppmv configurations in a way that only Annex I has to reduce emissions by 2020. Developing countries can follow their business as usual path.

Table 7. Parameters used for the sectoral approach

Parameter	Unit	450 ppmv CO_2eq. 2020	550 ppmv CO_2eq. 2020	650 ppmv CO_2eq. 2020
Reduction of Annex I	% below 1990 level	-46%	-26%	-13%
Iron and steel: Convergence level of GHG index	(no unit, 1 means is best available technology)[8]	0.8	1	BAU
Cement: Convergence level of GHG index	(no unit, 1 means is best available technology)	0.8	1	BAU
Electricity: decrease the share of coal and oil	% from 2004 to 2020	45%	30%	BAU
Pulp and paper: Convergence level of GHG index	(no unit, 1 means is best available technology)	0.8	1	BAU
Transport: Reduction of GHG index	% per year	3.5%	2%	BAU
Refineries: Convergence level of GHG index	(no unit, 1 means is best available technology)	0.8	1.5	BAU

[8] 1 is the today's best available technology. Figures > 1 indicate a worse performance; figures < 1 indicate a better performance. 0.8 for example means that the performance has to be 20% better than today's best available technology.

3.2.6 GHG intensity targets for all countries

Various Authors have suggested that targets are expressed as dynamic variables – including as a function of the GDP ("intensity targets") or variables of physical production (e.g. emissions per tonne of steel produced)[9]. Dynamic targets aim at providing more flexibility to the countries, so that high costs are avoided, if the economic development and therefore emission development is different than expected at the time the target is set. In principle, they do not limit the economic growth of countries, but require that economic development takes place in a carbon-efficient way.

For the illustrative case we have assigned intensity targets expressed as improvement of emissions/GDP at the same rate for all countries. This may be a less realistic case, but it may be instructive in understanding the dynamics of such an approach. The parameters used are included in Table 8.

Table 8. Parameters used for the GHG intensity target approach

Parameter	Unit	450 ppmv CO_2eq.		550 ppmv CO_2eq.		650 ppmv CO_2eq.	
		2020	2050	2020	2050	2020	2050
Equal reduction of GHG/GDP	%/year	5.6	5.3	4.0	4.4	2.6	3.2

3.2.7 Quantitative results and discussion

Figure 8, Figure 10 and Figure 12 show modelled results for the change in emission allowances from 1990 to 2020 and 1990 to 2050 for the 450, 550 and 650 ppmv CO_2eq. cases respectively for Contraction and Convergence (C&C), Common but Differentiated Convergence (CDC), Multistage, Triptych, the Sectoral approach, Global intensity targets and the reference case. The initial allocation of allowances before trading is shown. Final resulting emission levels after trading could be different.

As the future developments are unknown, we calculate one case for each of the IPCC SRES scenarios (A1B, A1Fl, A1T, A2, B1, B2) to capture a wide spread of possible future developments (Nakicenovic et al. 2000). In the figures we provide the median over the six scenarios and the whole spread as error bars. Comparing the reductions with the reference cases gives an indication about the level of effort needed to reach the reductions. Regions are explained in Appendix C. The results are also included in Appendix D, Table 23 to Table 28.

The horizontal red lines for Annex I countries indicate the emission level in 2010. This is the starting point for the calculations. For most countries this is the Kyoto target (solid lines). For the USA the 2010 level is based on the national target of an improvement of emissions per GDP by 18% from 2002 to 2012. This would result in emissions far above the Kyoto target (+23%, dotted line, compared to -7%). For Russia and the rest of Eastern Europe in Annex I we chose as a starting point the reference emissions in 2010 which are well below their Kyoto target (-32% compared to 0 to -8%) (dotted lines).

In most cases we show the necessary emission levels in 2020 and 2050 in comparison to the 1990 emissions. For a typical Annex I country emissions have declined from their 1990 value to their Kyoto target in 2010 (see Figure 7 left). From then on further reductions are necessary. The reductions shown in Figure 8, Figure 10 and Figure 12 include the reductions from 1990 to the Kyoto target plus the additional reductions after 2010. Typical Non-Annex I countries' emissions increase from 1990 until they participate (earliest after 2010), growth is then slowed and eventually turned into a reduction (see Figure 7 right). Therefore, the reductions shown in Figure 8, Figure 10 and Figure 12 usually show an increase over 1990 levels.

[9] E.g. Hargrave et al. 1998; Baumert et al. 1999; Lutter 2000; Müller et al. 2001; Bouille and Girardin 2002; Chan-Woo 2002; Lisowski 2002; OECD/IEA 2002; Ellerman and Wing 2003; Höhne et al. 2003; Müller and Müller-Fürstenberger 2003; Jotzo and Pezzey 2005; Pizer 2005; Kolstad 2006

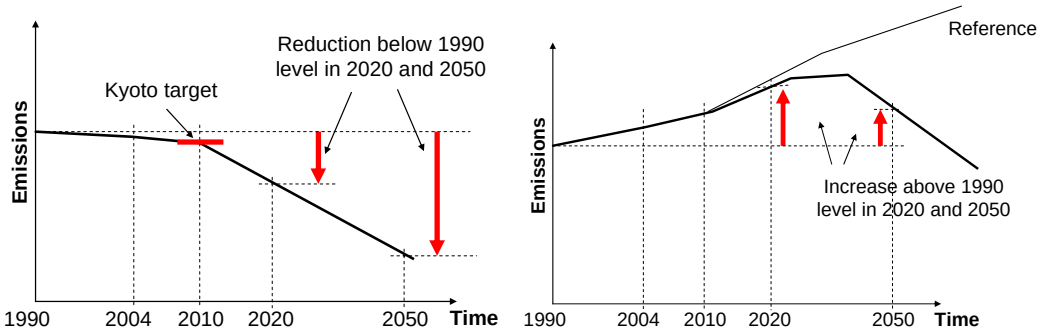


Figure 7. Illustrative pathway for an Annex I country (left) and a Non-Annex I country (right).

Data are not available for the sectoral approach for some countries or groups. The approach as it is used for this report does not provide the level of detail which is shown in the figures below. In this case Annex I data are available only for the whole group. For South Asia (SAsia) and Centrally Planned Asia (CPAsia) the values for India and China, are presented as these countries make up for nearly all emissions in these groups.

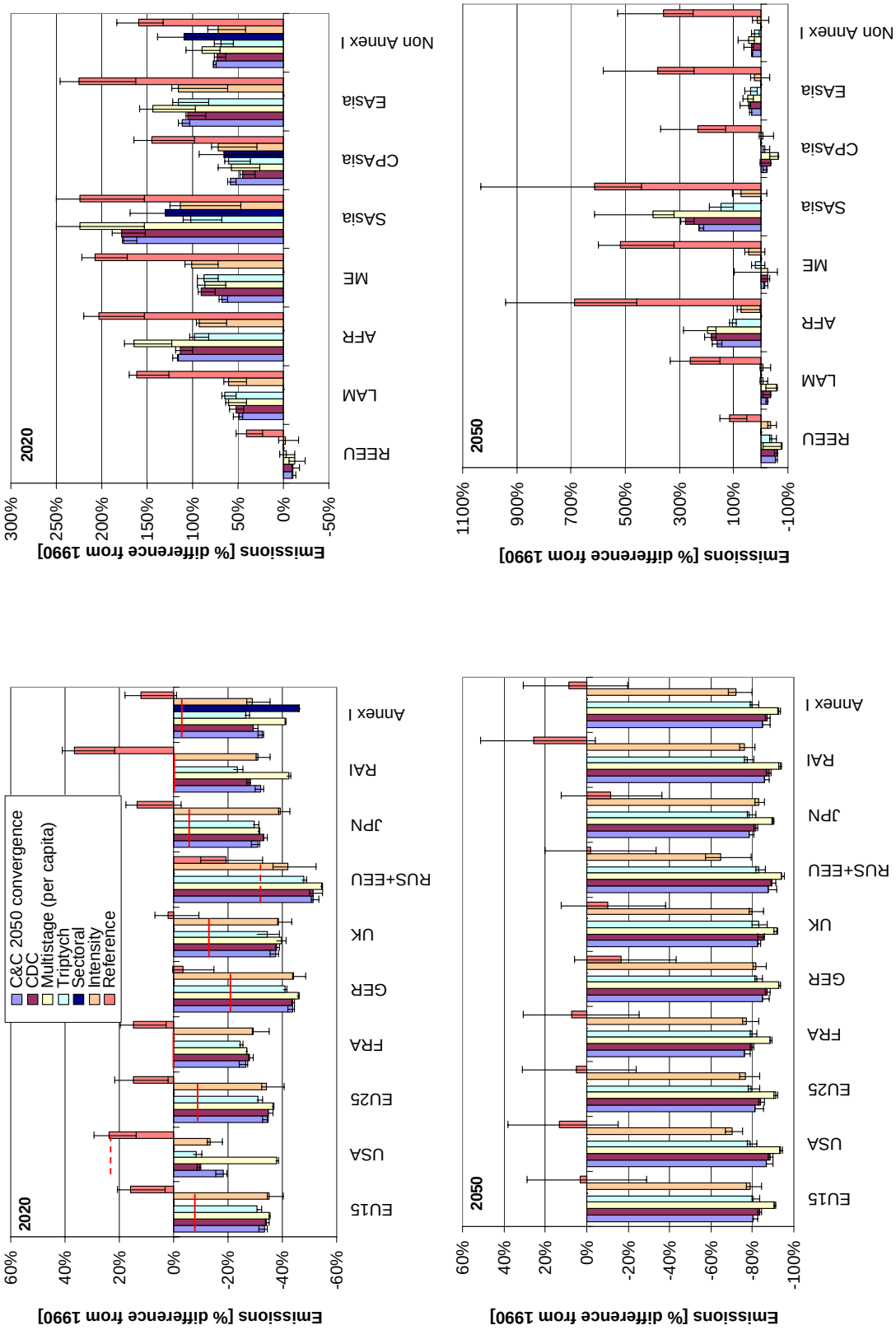


Figure 8. Change in emission allowances from 1990 to 2020 (top) or 2050 (bottom) under the 450 ppmv CO_2eq. scenario. Data are included for EU15, USA, EU25, FRA (France), GER (Germany), UK, RUS+EEU (Russia and the rest of Annex I countries from Eastern Europe), JPN (Japan), RAI (Rest of Annex I), Annex I, REEU (Rest of Eastern Europe), LAM (Latin America), AFR (Africa), ME (Middle East), SAsia (South Asia, mainly India), CPAsia (Centrally planned Asia, mainly China), EAsia (East Asia). A detailed description of the considered groups can be found in Appendix C. Data are included in Appendix D, Table 23 and Table 24. The horizontal red lines for Annex I indicate the emission level in 2010 which are similar to the Kyoto targets except for the USA and RUS-EEU.

Figure 9 gives an overview of the emission allowances in 2020 as percentage change from 2010 for the 450 ppmv CO_2eq. case. The absolute values are the same as in Figure 8 (top left). In this figure the relative change to 2010 is displayed, illustrating the necessary effort necessary *after* 2010. The largely political choice of the starting point in 2010 has significant implications on the results for 2020.

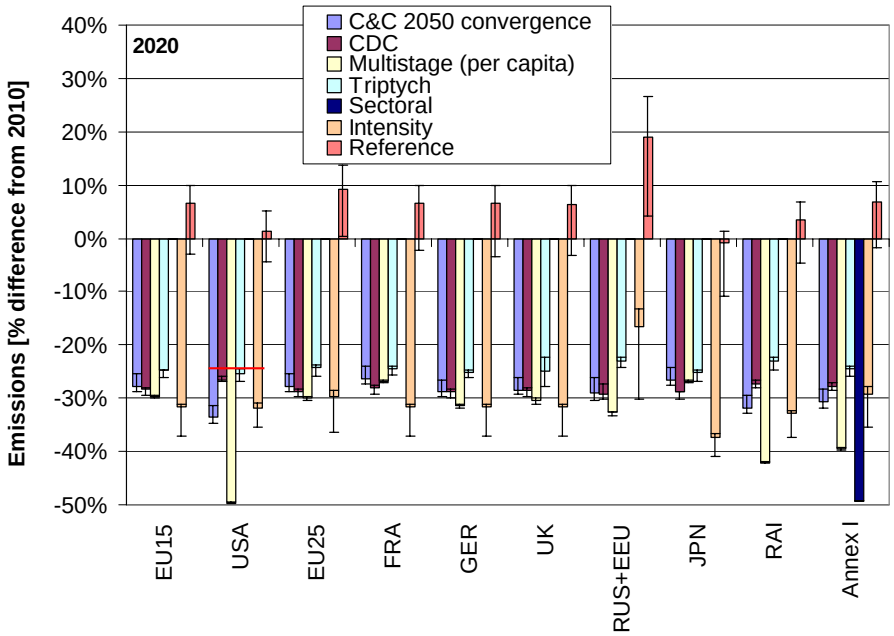


Figure 9. Change in emission allowances from 2010 to 2020 under the 450 ppmv CO_2eq. scenario for Annex I. Ranges are due to the use of the IPCC SRES scenarios. The horizontal red line indicates the Kyoto target of the USA in relation to its 2010 emissions.

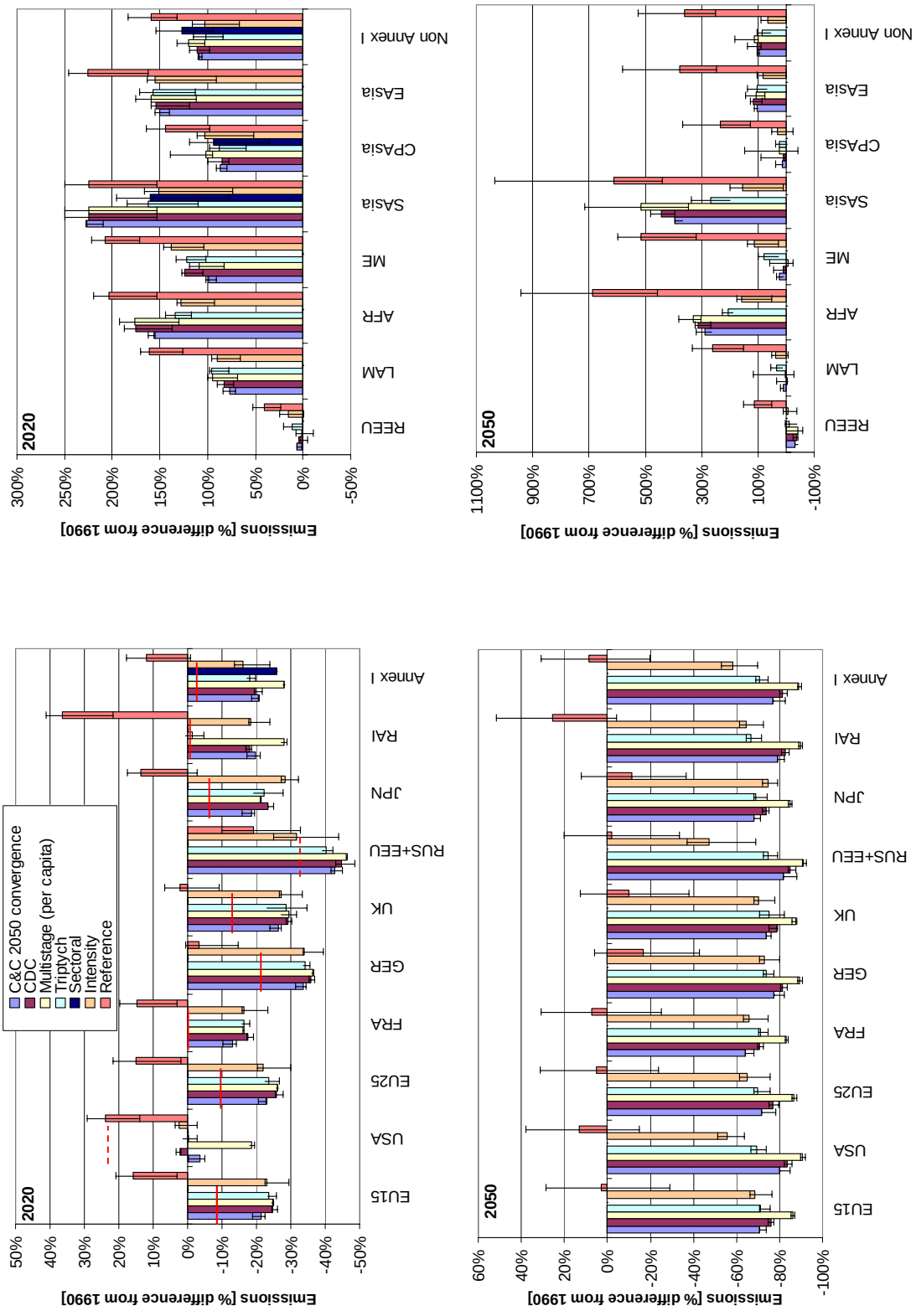


Figure 10. Change in emission allowances from 1990 to 2020 (top) or 2050 (bottom) under the 550 ppmv CO_2eq. scenario. Data are included for EU15, USA, EU25, FRA (France), GER (Germany), UK, RUS+EEU (Russia and the rest of Annex I countries from Eastern Europe), JPN (Japan), RAI (Rest of Annex I), Annex I, REEU (Rest of Eastern Europe), LAM (Latin America), AFR (Africa), ME (Middle East), SAsia (South Asia, mainly India), CPAsia (Centrally planned Asia, mainly China), EAsia (East Asia). A detailed description of the considered groups can be found in Appendix C. Data are included in Appendix D, Table 25 and Table 26. The horizontal red lines for Annex I indicate the emission level in 2010 which are similar to the Kyoto targets except for the USA and RUS-EEU.

Figure 11 provides an overview of the emission allowances in 2020 as percentage change from 2010 for the 550 ppmv CO_2eq. case. The underlying absolute values are the same as in Figure 10 (top left). In this figure the relative change to 2010 is displayed to make the effort necessary *after* 2010 more comparable. Before, between 1990 and 2010, some countries reduce according to their Kyoto targets, some reduce further (EITs), the US reduces less (+23% compared to 1990) and some countries follow their BAU (Turkey, Belarus). To evaluate the mere impact of the different reduction approaches Figure 11 can be useful.

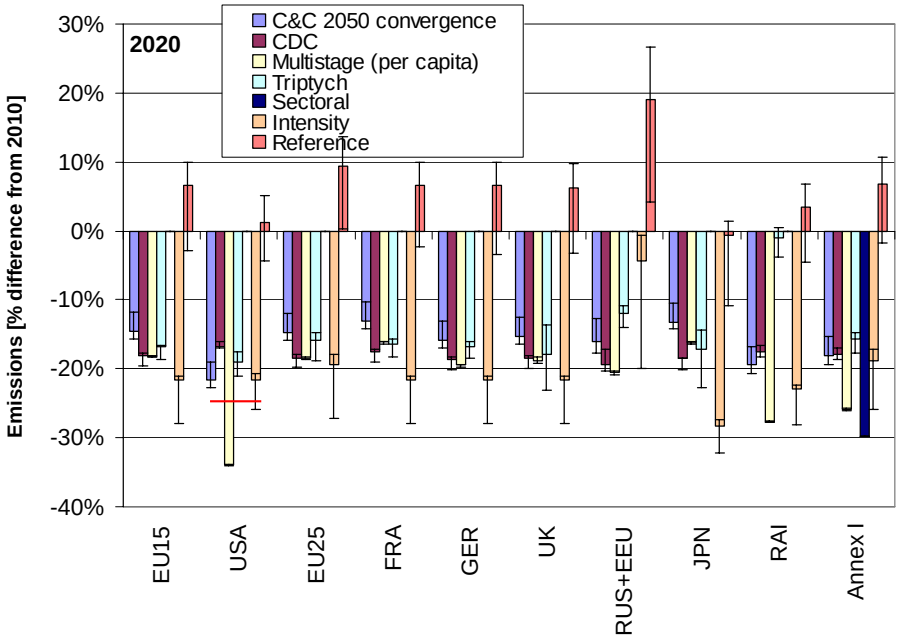


Figure 11. Change in emission allowances from 2010 to 2020 under the 550 ppmv CO_2eq. scenario for Annex I. Ranges are due to the use of the IPCC SRES scenarios. The horizontal red line indicates the Kyoto target of the USA in relation to its 2010 emissions.

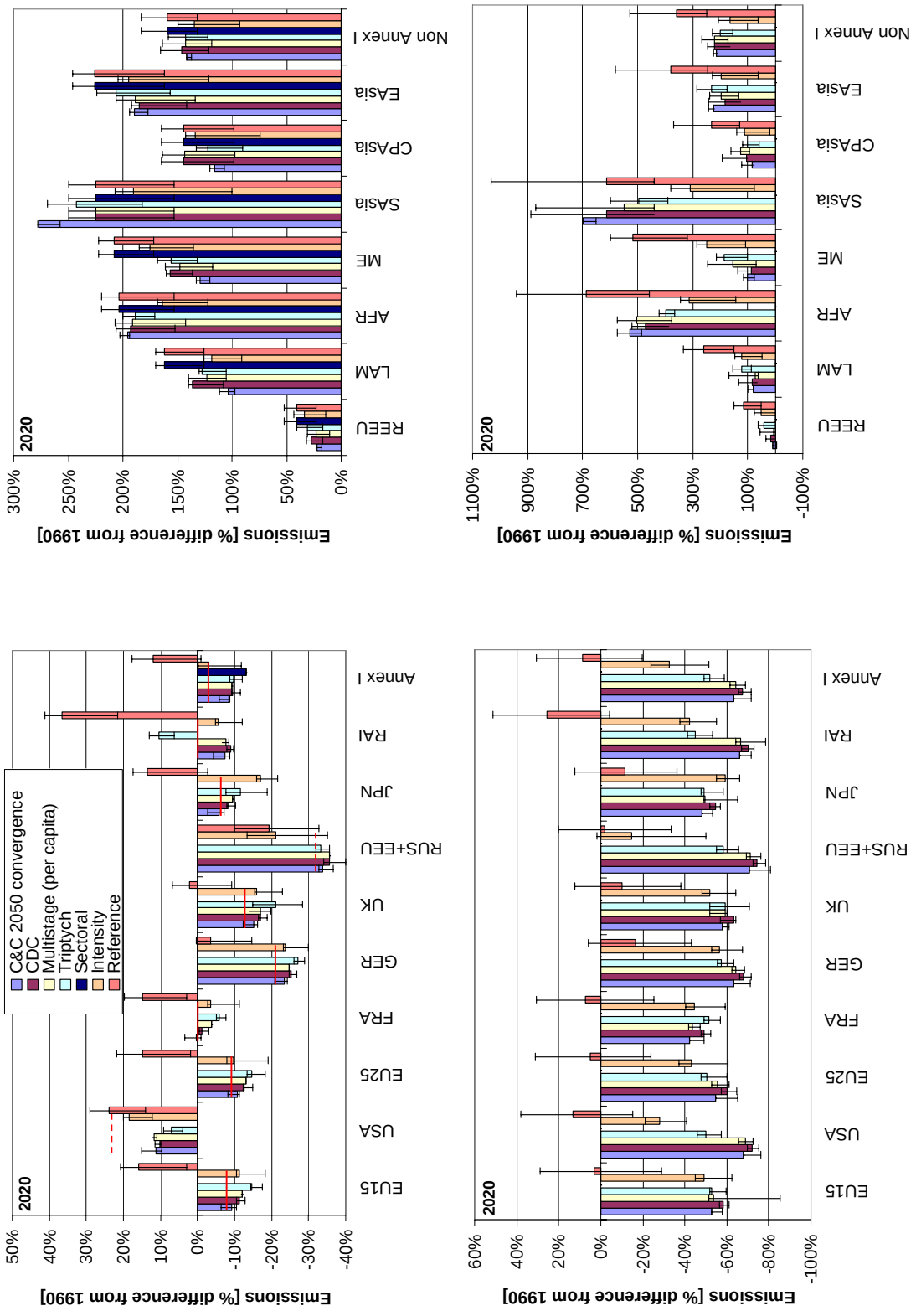


Figure 12. Change in emission allowances from 1990 to 2020 (top) or 2050 (bottom) under the 650 ppmv CO_2eq. scenario. Data are included for EU15, USA, EU25, FRA (France), GER (Germany), UK, RUS+EEU (Russia and the rest of Annex I countries from Eastern Europe), JPN (Japan), RAI (Rest of Annex I), Annex I, REEU (Rest of Eastern Europe), LAM (Latin America), AFR (Africa), ME (Middle East), SAsia (South Asia, mainly India), CPAsia (Centrally planned Asia, mainly China), EAsia (East Asia). A detailed description of the considered groups can be found in Appendix C. Data are included in Appendix D, Table 27 and Table 28. The horizontal red lines for Annex I indicate the emission level in 2010 which are similar to the Kyoto targets except for the USA and RUS-EEU.

Figure 13 provides an overview of the emission allowances in 2020 as percentage change from 2010 for the 650 ppmv CO_2eq. case. The absolute values are the same as in Figure 12 (top left). In this figure the relative change to 2010 is displayed to make the necessary effort *after* 2010 more comparable.

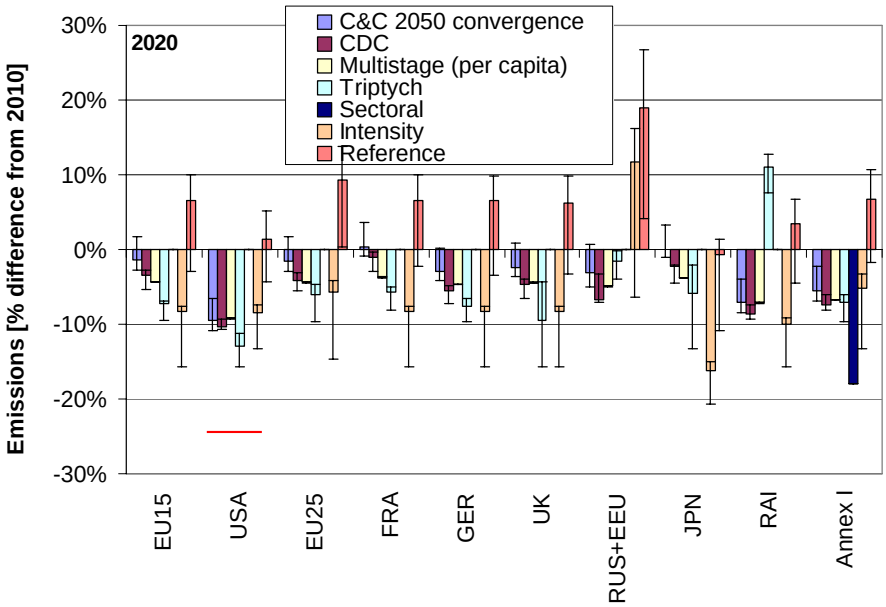


Figure 13. Change in emission allowances from 2010 to 2020 under the 650 ppmv CO_2eq. scenario for Annex I. Ranges are due to the use of the IPCC SRES scenarios. The horizontal red line indicates the Kyoto target of the USA in relation to its 2010 emissions of +23% above 1990.

Looking broadly at the results across the approaches, one can observe that significant reductions below 1990 levels for all approaches and stabilisation levels are necessary from developed countries in addition to early deviation from reference in developing countries. We also observe that the difference in reductions between stabilisation targets (450, 550 and 650 ppmv CO_2eq.) is usually larger than the difference between the various approaches aiming at one stabilisation target for most countries.

As we have kept the global emission level constant over all approaches, one can observe how the approaches distribute these global emissions over the countries and regions (Figure 3). On the one hand, under C&C, all countries participate and developing countries with high per capita emissions may need to reduce substantially. Annex I countries as a group have to reduce less relative to other cases. This is equally the case for the Triptych approach. For the particular assumptions used, developing countries (particularly the coal-intensive countries in Africa and South Asia in 2050) have to contribute more to the global reduction effort than for other cases. The CDC approach assumes action by developed countries first and delayed action by developing countries. Hence, the reductions necessary for Annex I under these approaches are higher in 2020 than for the other approaches. The setting used for the Multistage approach lean even more toward reductions by Annex I countries and delayed reductions by non-Annex I countries. Results for the sectoral approach show that it is nearly impossible to achieve the necessary reductions with the limited number of sectors included in these calculations. The parameters are very stringent for Annex I and non-Annex I countries. This makes clear that all sectors will have to be included to stabilise at a low level as 450 ppmv CO_2eq. Under the intensity targets approach the reduction efforts are more stringent for most Annex I countries, except for Russia. It has to be kept in mind, though, that this approach is strongly related to future assumptions of GDP development. Hence, the range of approaches here shows a wide spectrum of the weight between Annex I and non-Annex I action.

Still the results for individual countries and regions differ little across approaches. We observe that for most individual Annex I countries the resulting reductions below 1990 levels under all approaches are dominated by the starting point (the Kyoto target) and vary most between stabilisation levels not between approaches.

For most developing countries the differences between the various approaches are larger, because they make different assumptions on their participation (e.g. India, Indonesia, Philippines, and Nigeria). The Triptych approach, with the parameters used here, may be demanding for coal-intensive countries that in other approaches would not have participated, e.g. India (South Asia in Figure 9). But even here, the Triptych emission levels are still within the range of the reference scenarios, meaning that a Triptych target may not be too demanding. For other countries that need to participate in all approaches, such as countries in the rest of Eastern Europe and the Middle East, but also South Korea, Thailand, South Africa, Brazil, Argentina, Mexico, the levels across approaches are again more uniform as they are for Annex I countries. The differences between countries within one geographical region can be large. For example, Malaysia is participating in the Multistage system almost immediately, while participation of the Philippines is delayed until the middle of the century.

The ranges are summarised in Table 9.

Table 9. Ranges of emission reductions according to all applied approaches as percentage change from 1990 under the 450, 550 and 650 ppmv CO_2eq. scenarios. The rounded figures include the whole scenario ranges given as minimum and maximum values in Appendix D.

		2020	2050
450 ppmv CO_2eq.	Global *	+10%	-40%
	EU 25	-40% to -30%	-90% to -75%
	UK	-45% to -35%	-95% to -80%
	Annex I	-45% to -25%	-95% to -70%
	Non-Annex I	Substantial deviation from reference in all regions	Substantial deviation from reference in all regions
550 ppmv CO_2eq.	Global *	+30%	-10%
	EU 25	-30% to -20%	-90% to -60%
	UK	-35% to -25%	-90% to -70%
	Annex I	-30% to -15%	-90% to -55%
	Non-Annex I	Substantial deviation from reference in Latin America, Middle East, Centrally Planned Asia and East Asia	Substantial deviation from reference in all regions
650 ppmv CO_2eq.	Global *	+50%	+45%
	EU 25	-20% to -10%	-65% to -40%
	UK	-25% to -15%	-65% to -50%
	Annex I	-15% to 0%	-75% to -25%
	Non-Annex I	Deviation from reference in Latin America and Middle East, East Asia	Deviation from reference in most regions, especially in Latin America and Middle East and Centrally Planned Asia

* Global reduction values are chosen to represent one possible path towards the given stabilisation level (see Figure 4 and Table 2). Other global emission levels in 2020 and 2050 would be possible to reach the same stabilisation levels, and their choice would influence the necessary reductions for the country groups.

3.2.8 Qualitative discussion

Each of the considered approaches has its strengths and weaknesses. These are summarised in Table 10.

Table 10. Summary of the strengths and weaknesses of the approaches

	Strengths	Weaknesses
Contraction & Convergence	• Participation of all countries • Certainty about global emissions • Simple, clear concept • Includes cost-effective reduction options in developing countries through full international emissions trading • Support for least developed countries through excess emission rights • Compatible with Kyoto Protocol (reporting and mechanisms, CDM not necessary)	• National circumstances (including historical responsibility) not accommodated (optionally countries within one region can redistribute allowances to accommodate national concerns) • Substantial reduction for countries with high per capita emissions, also for developing countries • Also least developed countries need to be capable to of participating in emissions trading (national greenhouse gas inventories and emission trading authorities) • Excess emission rights for least developed countries need to be compensated by more stringent reduction targets for developed countries.
Common but diff. convergence	• Applies simple rules, thus, making approach transparent and comprehensive • Delay of non-Annex I countries takes account of the responsibility for past emissions • Certainty about global emissions • Eliminates the component of "hot air" (no excess allowances for low emission countries) • Compatible with Kyoto Protocol (reporting and mechanisms)	• National circumstances not accommodated, except per capita emissions and current membership of Annex I • Possibly too simple and not considering detailed national circumstances
Multistage	• Gradual phase in of countries, in line with UNFCCC spirit, taking into account national circumstances • General framework that can accommodate many ideas and satisfy many demands • Allows for gradual decision making • Trust-building as industrialised countries take the lead • Compatible with Kyoto Protocol (reporting and mechanisms)	• Can lead to a complex system, requires many decisions and allows for exceptions • Risk that countries enter too late so that some long term stabilisation options are lost • Incentives needed for countries to participate in a certain stage
Triptych	• National circumstances are explicitly accommodated • Explicitly allowing for economic growth at improving efficiency in all countries • Aims to put internationally-competitive industries on same level • Has been successfully been applied (on EU level) as a basis for negotiating targets • Compatible with Kyoto Protocol (reporting and mechanisms)	• High complexity of the approach requires many decisions and sectoral data, making global application a challenge, and may be perceived as not transparent • Agreement on required projections of production growth rates for heavy industry and electricity may be difficult
Sectoral	• Explicit consideration of national circumstances per sector • Provides focus on most important sectors and particular reduction options • If dynamic, provides flexibility and allows for growth in production • Makes participation of many selected sectors and consequently of countries easier • If applied equally globally, decreases competitiveness concerns • Can be build into the Kyoto system	• Only partial coverage of sectors may make it less feasible to reach low stabilisation levels • Requires detailed sectoral information, which is currently only available for selected countries and sectors • Require careful target setting • Reduce certainty on the global emission level, environmental effectiveness not guaranteed since increases in production volumes (and thus GHG emissions) are possible
Intensity	• Allowing for economic growth and focuses on improving the carbon efficiency of the economy • Compatible with Kyoto Protocol (reporting and mechanisms), but requires additional rules for emission trading	• Uncertainty of the global emission level, environmental effectiveness not guaranteed • Problematic if GDP is reduced due to economic difficulties • Such targets are difficult to set and to compare between countries • Requires monitoring of the GDP

From the quantitative results, we observe that in the long run emissions have to be reduced substantially, eventually converging to similar (low) (per capita) emission levels. Converging per capita emissions as a concept for the long term could be part of a future regime but is not likely for the near term. Classic Contraction and Convergence may be too simple to accommodate the concerns of all countries. Also a decision that all countries participate at once would be unrealistic.

The "Common but Differentiated Convergence" approach is likely to also meet resistance of some developed countries due to the element of per capita convergence. But even if is not implemented in its entirety, future decisions could be guided by the principles provided in the approach: that developed countries' per capita emissions converge in the long term and that developing countries do the same but delayed and conditional on developed country action.

The Triptych approach is a very sophisticated approach to share emission allowances within any group of countries. It, hence, has high data requirements. In particular, the assumed future production growth rates are critical. The approach could be applied globally but it is best applied on any subset of countries (e.g. in the group of reducing countries in a staged approach) where sectoral data are available. The approach can accommodate concerns of many countries.

The sectoral approach can provide an incentive for countries to start participating with emission targets. If applied globally it could decrease competitiveness concerns. However as seen in the quantitative results, it is nearly impossible to achieve the necessary reductions with the limited number of sectors included in these calculations. This indicates that all sectors will have to be included to stabilise at a low level such as 450 ppmv CO_2eq.

Intensity targets (expressed as emissions per GDP) could be set as stringent as absolute targets although the ultimate outcome remains uncertain. Their use needs to be considered with care since setting such targets is difficult as it involves additional knowledge about the relation between emissions and GDP. The approach applied to all countries equally as presented here may not have a realistic chance of being implemented, but shows how fast growing countries can benefit from this concept.

The multistage approach is very flexible and can accommodate various national circumstances. The critical element of the approach is that additional countries participate early enough so that stringent environmental goals can be reached. Incentives for such participation (not just thresholds) may have to be included into the system. To reach 450 ppmv CO_2eq., additional countries, especially newly industrialised countries, need to participate at a relatively early stage, soon after 2012 by preference, major regions (East Asia and South Asia) before the middle of the century. The threshold for entering the absolute reduction stage would be significantly lower per capita emissions and GDP levels compared to today's Annex I countries' levels. Model outcomes also critically depend on the time when large countries such as China and India enter the system.

3.3 SENSITIVITY ANALYSIS FOR ALTERNATIVE BURDEN SHARING KEYS FOR ANNEX I COUNTRIES

In this section we calculate sensitivity analyses for an emissions reduction of the group of Annex I countries in 2020 consistent with stabilisation levels of 450 and 550 ppmv CO_2eq (see Figure 3). For these levels of ambition the group of Annex I countries has to collectively reduce emissions about -30% and -20% compared to 1990 levels respectively. As starting point again we assume that all countries reach the minimum of their Kyoto target or their BAU by 2010. Only the USA is assumed to lie above its Kyoto target. The overall Annex I emission allowances in 2010 lie at around -3% compared to 1990 levels, thus the gap of around 27 and 17 percentage points remains – this has to be reduced between 2010 and 2020. The different reduction approaches named below will be considered to reach the reduction target in the sensitivity analysis. Detailed results are included in Appendix D, Table 29 and Table 30.

We considered seven different ways to distribute emission allowances among Annex I countries (burden sharing keys) as described below:

- Equal percentage reduction of absolute emissions
- GHG intensity targets

- Convergence of emissions per GDP
- Convergence of emissions per capita
- The Brazilian historical responsibility proposal
- Triptych
- Sectoral approach

3.3.1 Equal percentage reduction of absolute emissions

Equal percentage reduction of absolute emissions includes the assumption that all countries reduce their absolute emissions by the same annual percentage rate after 2010. Note that this reduction is not linear but exponential: the reduction rate is related to the emissions of the previous year, which decline over time.

Between 1990 and 2010 most Annex I countries reduce according their Kyoto target, except the USA, Turkey and the EITs. In the Annex I sensitivity case we need the annual rate of 3.3% reduction between 2010 and 2020 compared to the emissions of the year before to reach an emission reduction of -30% below 1990 levels in 2020 for the whole group of Annex I. E.g. the UK will reduce 12.5% between 1990 and 2010 according to their Kyoto target. Between 2010 and 2020 the UK will reduce 3.3% annually compared to the emissions of the year before. In 2020 not all countries have reduced by the same percentage rate relative to 1990 because of the different reductions between 1990 and 2010. Table 11 includes the chosen parameter for all sensitivity test runs. The reduction rate to reach -20% lies around 2.0% per year.

Table 11. Parameter choices for equal percentage reduction of absolute emissions in the Annex I sensitivity calculations aiming at different group reduction levels by 2020

	Annex I sensitivity	
Group reduction by 2020	**-30%**	**-20%**
Country reduction [% per year]	3.3	2.0

3.3.2 GHG intensity targets

Intensity targets as they are included in this report are based on reduction of emissions per GDP by the same percentage rate for all countries after 2010. Again most countries reach their Kyoto targets which results in a reduction of about -3% by 2010 for the group of Annex I countries. Between 2010 and 2020 all Annex I countries reduce their emission intensity. As one example, we need a reduction rate of emissions per GDP of 5.9% per year per Annex I country over 10 years to reach the target of -30% below 1990 levels in 2020 for the group of Annex I. The reduction rate to reach -20% lies around 4.6% per year. The chosen parameters for all test runs are provided in Table 12. The average decrease in emission intensity of CO_2eq. per GDP for Annex I was 2.1% between 1990 and 2004. Figure 14 shows this change for each year for Annex I, non-Annex I and the global total.

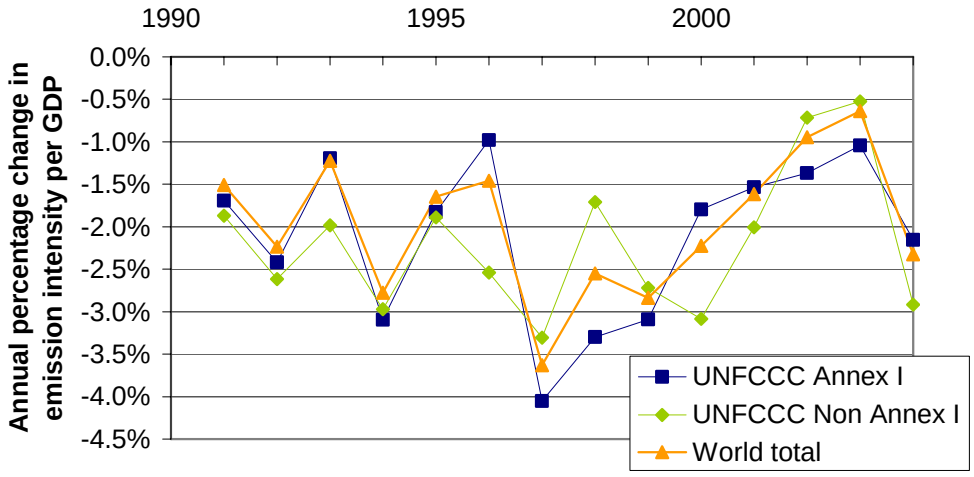


Figure 14. Annual percentage change in emission intensity (CO_2eq. per GDP) between 1990 and 2004 for Annex I, non-Annex I and the global total.

Table 12. Parameter choices for GHG intensity targets in the Annex I sensitivity calculations aiming at different group reduction levels by 2020

	Annex I sensitivity	
Group reduction by 2020	**-30%**	**-20%**
Intensity reduction [% per year]	5.9	4.6

3.3.3 Convergence of emissions per capita

Convergence of emissions per capita assumes that all countries' per capita emissions converge linearly to the same level. Again, between 1990 and 2010 most Annex I countries reduce according their Kyoto target, except the USA, Turkey and the EITs. This results in an overall reduction of about -3% for the group of Annex I countries compared to 1990 emissions. To reach e.g. the difference of 27 percentage points to reach -30% for the group of Annex I in 2020 we need a convergence level of 1.5 tCO_2eq. per capita and year for a convergence in 2040. The convergence level to reach -20% lies around 3.1 tCO_2eq. per year.

Default convergence level should be 2050 for these calculations. Only for the very stringent case of -30% an earlier convergence is necessary to meet the target. The chosen parameters for all test runs are provided in Table 13.

Table 13. Parameter choices for convergence of emissions per capita in the Annex I sensitivity calculations aiming at different group reduction levels by 2020

	Annex I sensitivity	
Group reduction by 2020	**-30%**	**-20%**
Convergence year	2040	2050
Convergence level [tCO_2eq. per capita and year]	1.5	3.1

3.3.4 Convergence of emissions per GDP

The convergence of emissions per GDP case includes the assumption of converging emissions per GDP for all Annex I countries. For convergence in 2040 the convergence level has to lie around 0.03 kg CO_2eq. per US$(2000) to reach a reduction of -30% for Annex I in 2020. The convergence level to reach -20% lies around 0.06 kg CO_2eq.per US$ (2000).

Default convergence level should be 2050 for these calculations. Only for the very stringent case -30% for Annex I an earlier convergence is necessary to meet the target. The chosen parameters for all test runs are provided in Table 14.

Table 14. Parameter choices for convergence of emissions per GDP in the Annex I sensitivity calculations aiming at different group reduction levels by 2020

	Annex I sensitivity	
Group reduction by 2020	**-30%**	**-20%**
Convergence year	2040	2050
Convergence level [kg CO_2eq. per US$(2000)]	0.03	0.06

3.3.5 The Brazilian historical responsibility proposal

During the negotiations of the Kyoto Protocol in 1997, the delegation of Brazil proposed to share the burden of emission reductions according to the historical responsibility of countries to climate change (UNFCCC 1997). With the adoption of the Kyoto Protocol in 1997, the since then called "Brazilian Proposal" basically was overtaken, but the consideration of its methodological and scientific aspects has been subject to continued debate within the international negotiations and in the scientific literature[10].

According to the Proposal, reduction obligations between countries are differentiated proportional to the countries' relative share of responsibility for climate change. Here, we used cumulative GWP weighted emissions from 1900 as the indicator of historical responsibility. Historical CO_2 emissions are taken from Marland et al. 2003 and exclude land-use change and forestry. Historical CH_4 and N_2O emissions are derived from national emissions for 1990 extended backward using the regional growth rates of Van Aardenne et al. 2001.

An Annex I a group reduction of 3.3% per year for will be necessary to reach -30%. The reduction rate to reach -20% lies around 2.06% per year; emissions for individual countries are higher or lower, depending on their historical responsibility.

Table 15. Parameter choices for historical responsibility approach in the Annex I sensitivity calculations aiming at different group reduction levels by 2020

	Annex I sensitivity	
Group reduction by 2020	**-30%**	**-20%**
Annex I group reduction [% per year for the whole group (individual countries can have a different reduction percentage)	3.3	2.0

[10] UNFCCC 1997; Rose et al. 1998; Meira Filho and Gonzales Miguez 2000; Pinguelli Rosa and Ribeiro 2001; den Elzen and Schaeffer 2002; den Elzen et al. 2002; La Rovere et al. 2002; Andronova and Schlesinger 2004; Pinguelli Rosa et al. 2004; Trudinger and Enting 2004; den Elzen et al. 2005a; den Elzen et al. 2005c; Höhne and Blok 2005; Rive et al. 2006

3.3.6 Triptych

We applied the same methodology as described in Section 3.2.4 but only for the group of Annex I countries. To meet the given reduction levels, we changed the parameters and used the values given in Table 16.

The contributions of the big sectors industry, electricity and domestic shall be balanced as far as possible. However, this is not always feasible if reasonable parameters are chosen. For the very stringent case of -30% reduction the domestic sector contribution is considerably lower than the industry and electricity sectors. The absolute reduction in this sector is substantial, however, because of the sector's large contribution to total emissions. It was only possible to reach a reduction of -28.8% with the parameters set at their feasible limits.

Table 16. Parameter choices for the Triptych Annex I sensitivity calculations aiming at different group reduction levels by 2020

Group reduction by 2020		Annex I sensitivity	
		-30%	-20%
Sector	**Quantity**		
Industry	Maximum deviation of total industrial production at country level in 2050	45%	45%
	Maximum deviation of total industrial production at global level in 2050	10%	10%
	Convergence of Energy Efficiency Indicator in 2050	0.1	0.55
	Structural change factor	0.1	0.6
Electricity	Maximum deviation of total power production at country level in 2050	45%	45%
	Maximum deviation of total power production at global level in 2050	10%	10%
	Share of renewables and emission free fossil in 2050	100%	70%
	Share of CHP in 2050	0%	20%
	Reduction of solid fuels in 2050 compared to base year	100%	70%
	Reduction of liquid fuels in 2050 compared to base year	100%	80%
	Amount of nuclear energy	Absolute unchanged	
	Amount of natural gas	Remainder	
	Total efficiency of CHP	90%	90%
	Convergence of power generation efficiency of solid fuels in 2050	50%	50%
	Convergence of power generation efficiency of liquids fuels in 2050	55%	50%
	Convergence of power generation efficiency of gas in 2050	70%	65%
Domestic sector	Domestic convergence level – per capita emissions in tCO_2/cap/yr in 2050	0.1	0.5
Fossil fuel production	Fossil fuel emission level – % total emissions below base year in 2050	100%	90%
Agriculture	Reduction below reference scenario emissions in 2050 – low GDP/cap	80%	50%
	Reduction below reference scenario emissions in 2050 – high GDP/cap	90%	70%
Waste	Waste convergence level – per capita emissions in 2050	0	0

3.3.7 Sectoral approach

We applied the same methodology as described above in Section 3.2.4 but in this case for the Annex I countries only. As this approach only covers a limited set of sectors, the reductions in these sectors have to be substantial to allow the other sectors to develop according to the reference.

Table 17. Parameters used for the sectoral approach in the Annex I sensitivity

		Annex I sensitivity	
Parameter	**Unit**	**-30%**	**-20%**
Iron and steel: Convergence level of GHG index	(no unit, 1 means is best available technology)	0.6	0.9
Cement: Convergence level of GHG index	(no unit, 1 means is best available technology)	0.5	0.9
Electricity: decrease the share of coal and oil	% from 2004 to 2020	80%	55%
Pulp and paper: Convergence level of GHG index	(no unit, 1 means is best available technology)	0.5	0.9
Transport: Reduction of GHG index	% per year	8%	5%
Refineries: Convergence level of GHG index	(no unit, 1 means is best available technology)	0.4	0.9

3.3.8 Results for Annex I sensitivity analyses

This section presents the results of the sensitivity analyses of burden sharing between Annex I countries. In all cases the group of Annex I countries reduces emissions by 20% and 30% below 1990 levels in 2020.

The methodological background to these calculations is similar to Section 3.2. For some countries, data are not available for all approaches. The reasons may be the lack of country data (e.g. historical data for Monaco or Turkey). Again the implementation of the sectoral approach as it is used for this report does not provide the level of detail which is shown in the figures below.

We show the data here on a country basis although future data used is mostly based on regional data applied to the current country data. For example, the GDP of Germany is country specific but the GDP growth is taken from the GDP growth of the region OECD Europe. All countries within this region have been assigned the same future GDP growth rate. Approaches that rely on detailed future data have to be interpreted with care. The large range of the future values presented here as error bars captures the uncertainty about the future growth and the differentiated growth between countries within one region.

Figure 15 includes the results of the sensitivity analyses for the 41 Annex I countries (incl. Kazakhstan), the EU 15, and the EU 27. It shows emissions and emission allowances under different burden sharing keys on country level. Data are included in Appendix D, Table 29 and Table 30.

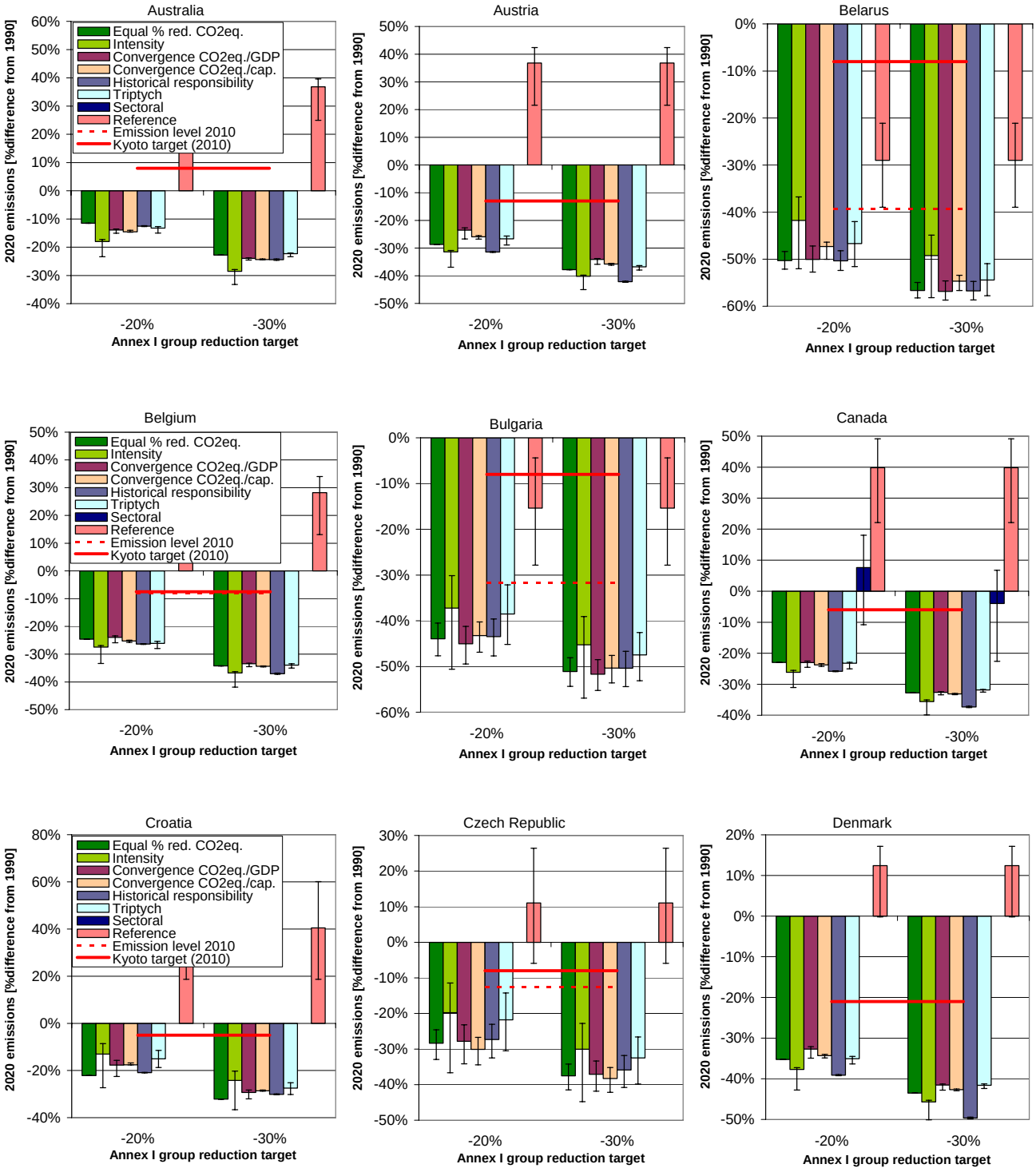


Figure 15. Annex I reference emissions and emission allowances under different burden sharing keys on country level. The group of Annex I countries reduces 20% and 30% below 1990 levels in 2020. Data are included in Appendix D, Table 29 and Table 30.

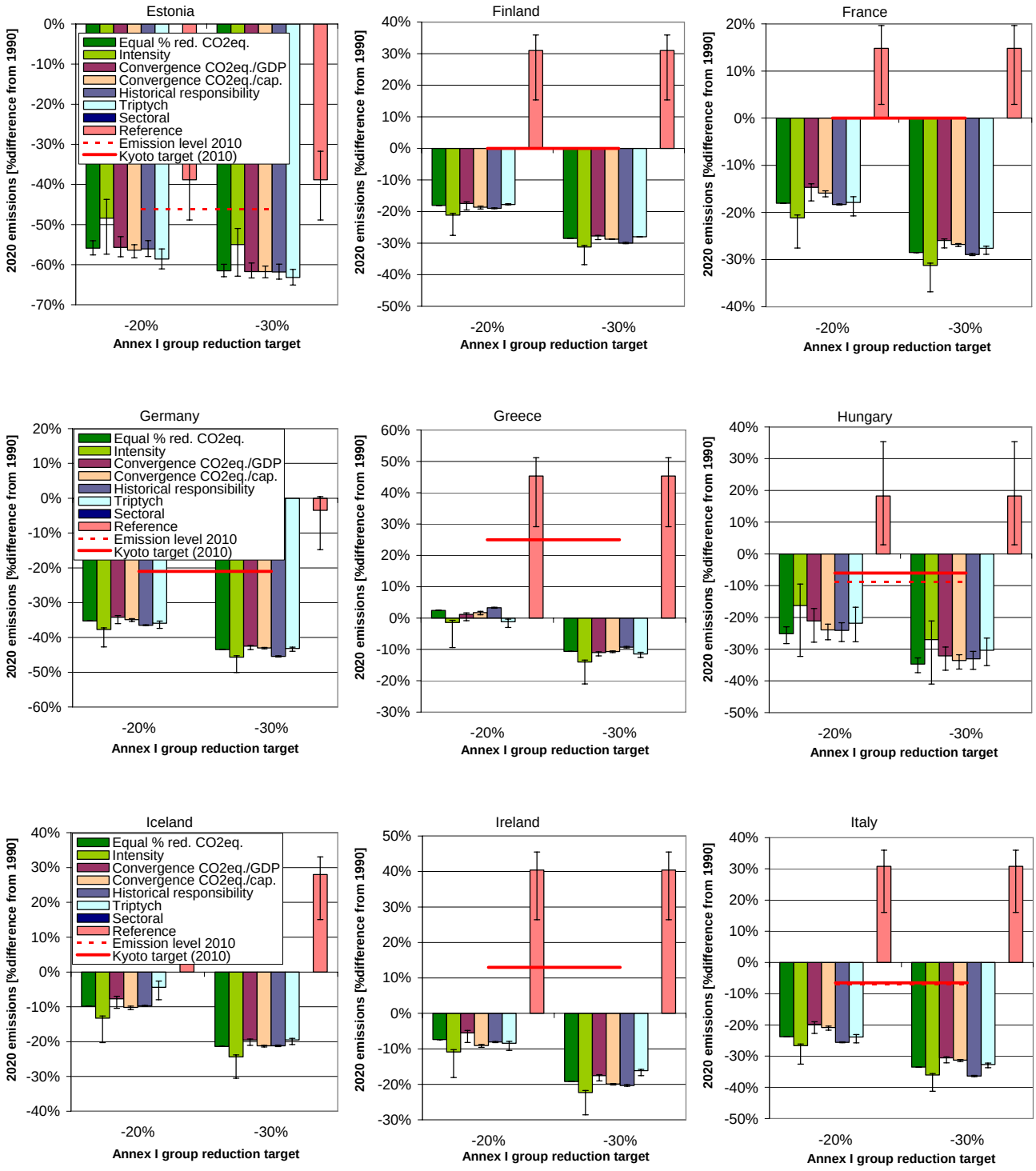


Figure 15. Annex I reference emissions and emission allowances under different burden sharing keys on country level. The group of Annex I countries reduces 20% and 30% below 1990 levels in 2020. Data are included in Appendix D, Table 29 and Table 30.

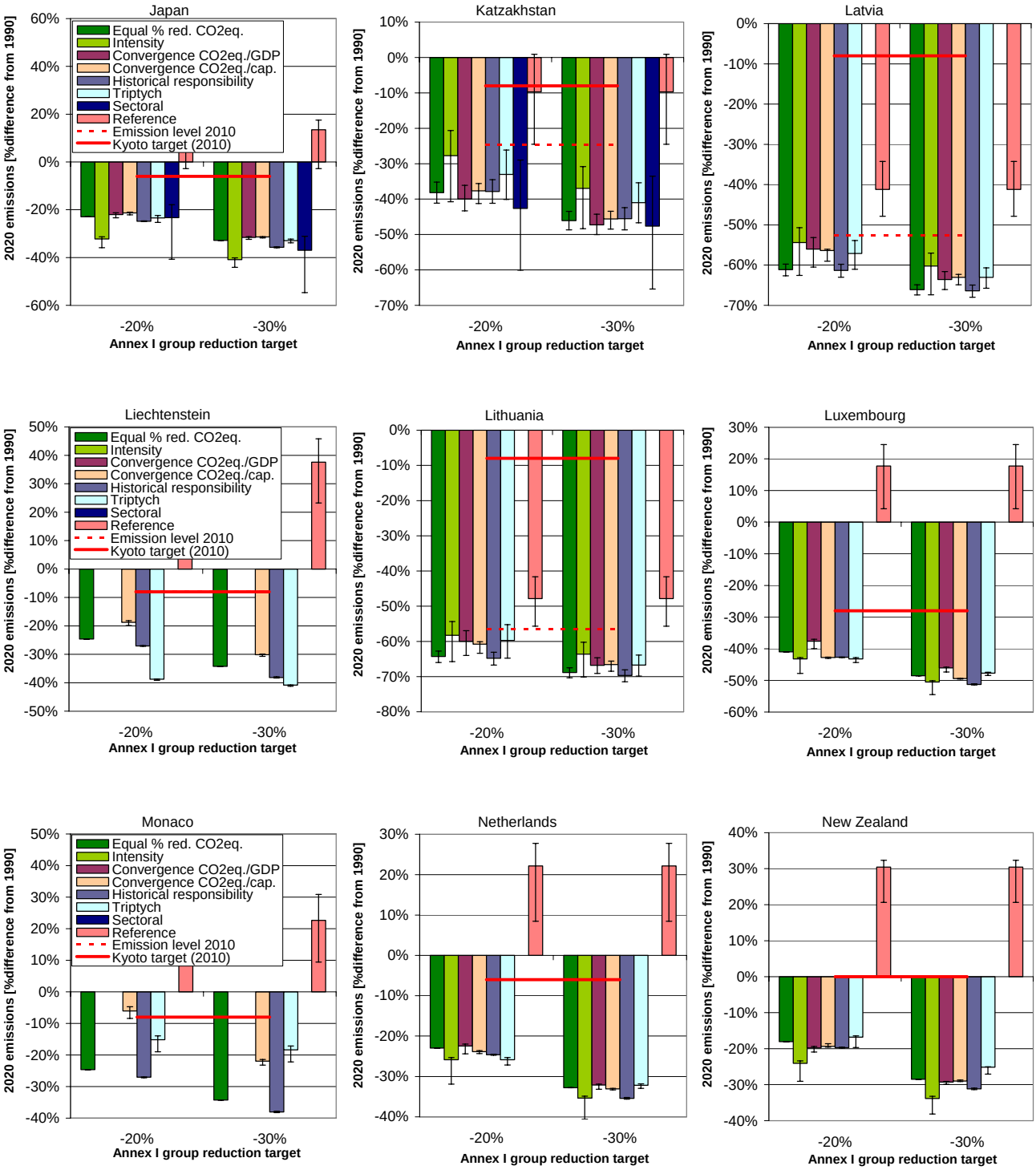


Figure 15. Annex I reference emissions and emission allowances under different burden sharing keys on country level. The group of Annex I countries reduces 20% and 30% below 1990 levels in 2020. Data are included in Appendix D, Table 29 and Table 30.

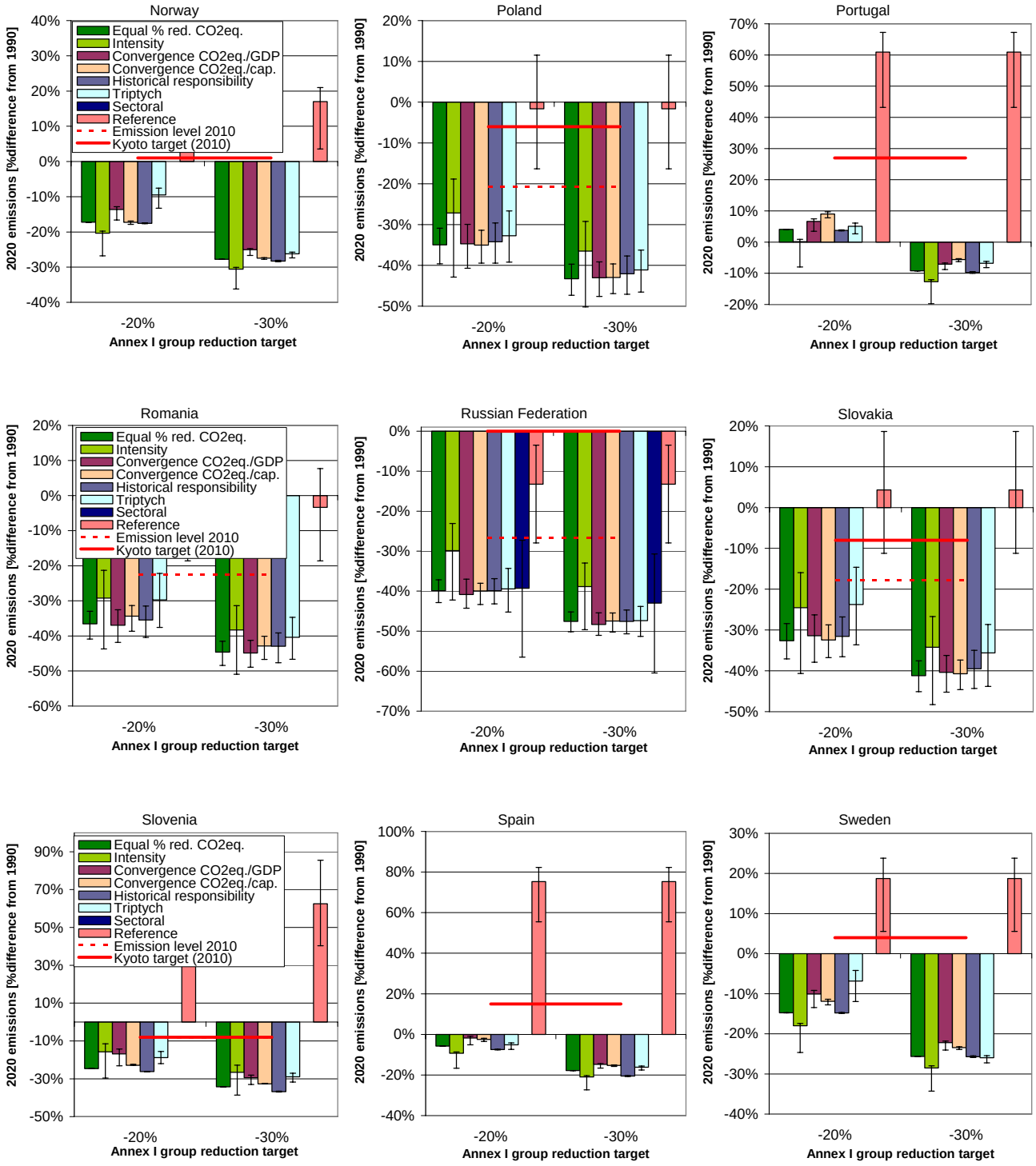


Figure 15. Annex I reference emissions and emission allowances under different burden sharing keys on country level. The group of Annex I countries reduces 20% and 30% below 1990 levels in 2020. Data are included in Appendix D, Table 29 and Table 30.

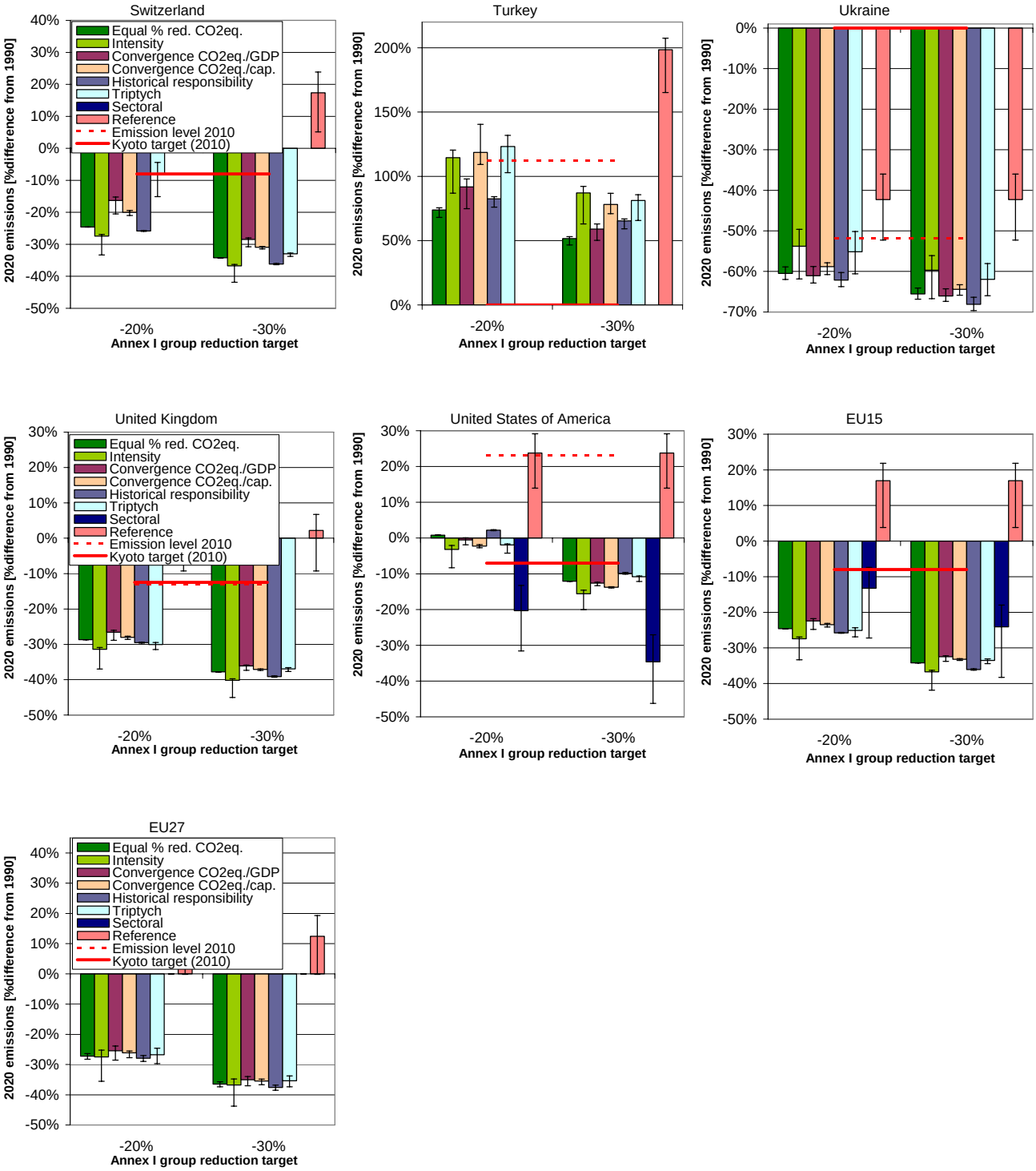


Figure 15. Annex I reference emissions and emission allowances under different burden sharing keys on country level. The group of Annex I countries reduces 20% and 30% below 1990 levels in 2020. Data are included in Appendix D, Table 29 and Table 30.

We observe from Figure 15 that for most countries the reductions are influenced considerably by the starting point in 2010 (i.e. the lower of the Kyoto target or the reference emissions, the national target for the USA).

For most countries the variation in emission allowances for the different approaches is around 5 to 10 percentage points (for -20% reduction) and 5 to 15 percentage points (for -30% reduction). For -20% reduction for most countries the emissions allowances are around 10 to 20 percentage points more stringent that their Kyoto targets (or their 2010 emission level for countries that do have targets or do not meet them, such as the USA and Russia), but there are also some exceptions. For -30% reduction the ranges lies between 20 to 35 percentage points for most countries. For many Eastern countries it is less, between 10 and 20 percentage points.

Equal percentage emission reductions can be seen as a reference, to which the other approaches can be compared. Under all approaches, countries' emissions develop the same between 1990 and 2010. Under equal percentage reduction all countries have to reduce the same percentage rate between 2010 and 2020.

The intensity target approach assigns more emission allowances to those countries for which a higher GDP growth is assumed. For all EIT countries the GDP growth is assumed higher than average, therefore they receive more emission allowances than under equal percentage reductions. For all other countries the growth is assumed lower than average, therefore they receive less emission allowances than under equal percentage reductions.

Convergence of emission per GDP is less stringent compared to equal percentage reductions for countries with already low emissions/GDP. This is the case for example for Switzerland with presently very low emissions per GDP (low emissions due to hydro power and high GDP).

Convergence of emission per capita is less stringent compared to equal percentage reductions for countries with already low per capita emissions, e.g. Portugal or Sweden. Convergence of emission per capita is more demanding for countries with high per capita emissions, e.g. Australia and USA.

Historical responsibility is less stringent compared to equal percentage reductions for countries with less historical emissions. The ratio between historical emissions and current emissions per country is the decisive factor. This factor is relatively low for, e.g., the USA, therefore less reductions are necessary under this approach compared to equal percentage reductions. Countries with relatively high historical responsibility (more historical emissions compared to current emissions) such as Germany or the UK have to reduce more under this approach.

The Triptych approach combines many elements and characteristics of countries so that a general trend per country is not directly apparent. It is for example relatively mild to New Zealand with its high share of agricultural emissions, as it requires less stringent reductions for this sector due to the absence of mitigation options. It is also mild to those countries for which high growth is assumed, i.e. the Eastern European countries. However, this approach relies on regional growth rates applied to the countries and has to be interpreted with caution.

The sectoral approach has only been calculated for a limited number of countries. It also cannot accommodate the condition of a common emission level in 2010 as for the other approaches. The values shown here are therefore not directly comparable to the other approaches. The large reductions in the USA are due to the very demanding constrains on the use of coal in this approach.

In summary we observe that generally the differences per country between the approaches are small. Still, each country has its particular national circumstances that will make one or the other approach preferable. It seems to be difficult to find the one formula that can accommodate all countries preferences. But these data can be valuable background information for the negotiations on future targets.

4. DISCUSSION OF THE RESULTS PER COUNTRY/GROUP

In this section, we discuss and assess the implications of the different architectures on Brazil, China, EU 25, India, Japan, Mexico, Russia, South Africa, South Korea and USA. We first provide an overview of the results for these countries. We then assess qualitatively the effects of international emission trading

under the different future frameworks. Furthermore, we consider which option a country is likely to choose in the case a menu approach, where countries chose one option out of a possible list.

4.1 BRAZIL

The basic data in the fact sheets illustrates that Brazil ranks very high among developing countries with respect to its state of development. Its GDP per capita is above that of most developing countries and is at around world average.

Brazil's emissions per capita are around world average and increasing. Emissions from electricity generation and transport are relatively low due to the extensive use of hydropower in electricity generation and biofuels in the transport sector. On the other hand, emissions from agriculture and industry are relatively high.

Figure 16 illustrates that emissions of Brazil are expected to grow roughly by a factor of 1.4 by 2020 and factor of 2 by 2050 above the 1990 level. Under all future scenarios calculated towards 550 ppmv CO_2eq. Brazil would need to slow the growth of emissions already by 2020 and reduce emissions thereafter to roughly 25% above 1990 emissions in 2050. With per capita emissions at world average, C&C and CDC approaches require early reductions. The multistage approach would grant Brazil more room to grow in the short term. The Triptych approach takes into account the particular national circumstances of Brazil of low emissions in electricity generation and transport and therefore requires less reduction than other approaches. The sectoral approach requires most reductions in the electricity sector, but Brazil's emissions in this sector are already low. Under this approach Brazil has to reduce the least. The intensity target approach would allow emission increase above average as Brazil's future GDP growth is expected to be above global average.

Emissions from deforestation are not included in these calculations, but constitute a major share of Brazil's emissions. Brazil will be expected to reduce these emissions substantially in the future.

In conclusion: The positive emission intensity in the electricity and transport sector may not be a sufficient argument to postpone action to slow emission growth. Emissions from other sectors, particularly deforestation, agriculture and industry are substantial and according to the indicators Brazil would have more capability to act that most other developing countries. The extent to which emission reductions are supported by other countries is to be decided. If Brazil would participate in the carbon market it can be expected that some of the reductions are financed through emission trading and project mechanisms. Any approach that can take into account the particular national circumstances of Brazil, such as e.g. the Triptych approach, could be favourable to Brazil.

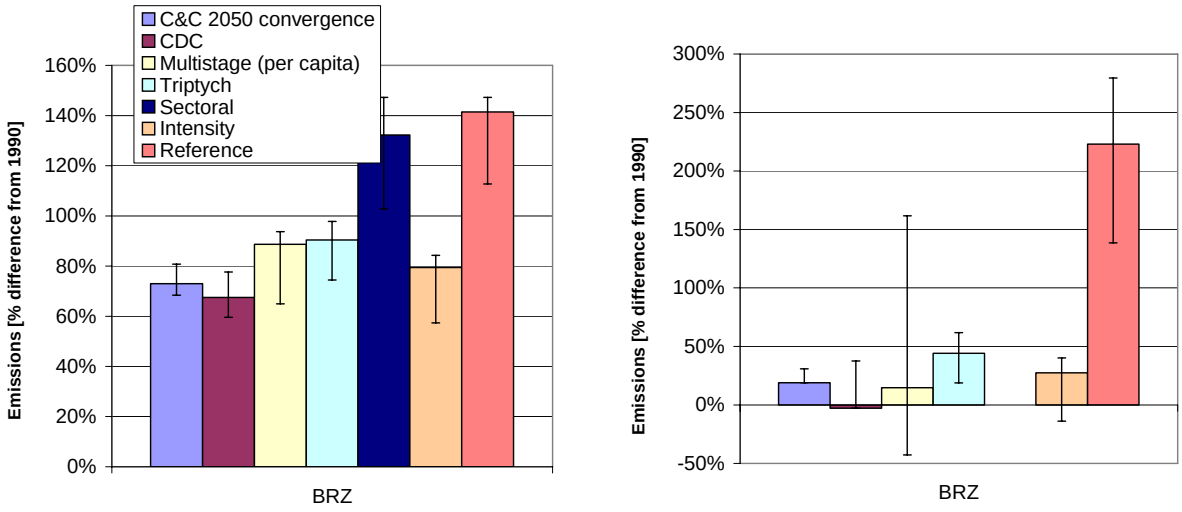


Figure 16. Emissions allowances according to the tested approaches to reach the 550 ppmv CO_2eq. development path for Brazil in 2020 (left) and 2050 (right). Data are included in Appendix D, Table 31.

4.2 CHINA

The basic data in the fact sheets illustrates that China ranks at around the average of developing countries with respect to its state of development. It emissions and GDP per capita are slightly above non-Annex I average.

China has experienced a strong economic and emission growth in the last 5 years. Growth rates are among the highest in the world. China is strongly dependant on coal; its emissions per kWh electricity are among the highest in the world.

Figure 17 illustrates that emissions of China are expected to grow roughly by a factor of 1.5 by 2020 and factor of 2 to 3 by 2050 above the 1990 level. The increase in emissions in China in recent years has shown how difficult it is to predict future emission growth in China. Accordingly the data presented here for China have to be taken with particular care. Under all future scenarios calculated towards 550 ppmv CO_2eq. China would need to slow the growth of emissions already by 2020 and reduce emissions thereafter to roughly 25% above 1990 emissions in 2050. Under C&C and CDC emissions have to be reduced below current non-Annex I average, China also needs to reduce emissions early under these approaches. The multistage approach would grant China more room to grow in the short term, in some scenarios no reductions would be necessary in 2020. The Triptych approach requires relatively strict emission limits for the electricity sector and therefore relatively stringent reductions for China. The same holds for the sectoral approach as implemented here. The intensity target approach would allow emission increase above average as China's future GDP growth is expected to be well above global average.

In conclusion: the size, the strong dependence of coal and the fast growth of China will result in high future emissions. Therefore, it will be necessary to slow China's emissions growth already by 2020. According to the indicators China would have average capability for a developing country. Therefore some of the emission reductions are most likely supported by other countries. If China would participate in the carbon market it can be expected that a large share of the reductions is financed through emission trading and project mechanisms, as the marginal emission reduction costs are very low compared to other countries. For example, under Contraction and Convergence China would have to reduce emissions below reference but would at the same time have a net positive impact from the sale of emission allowances.

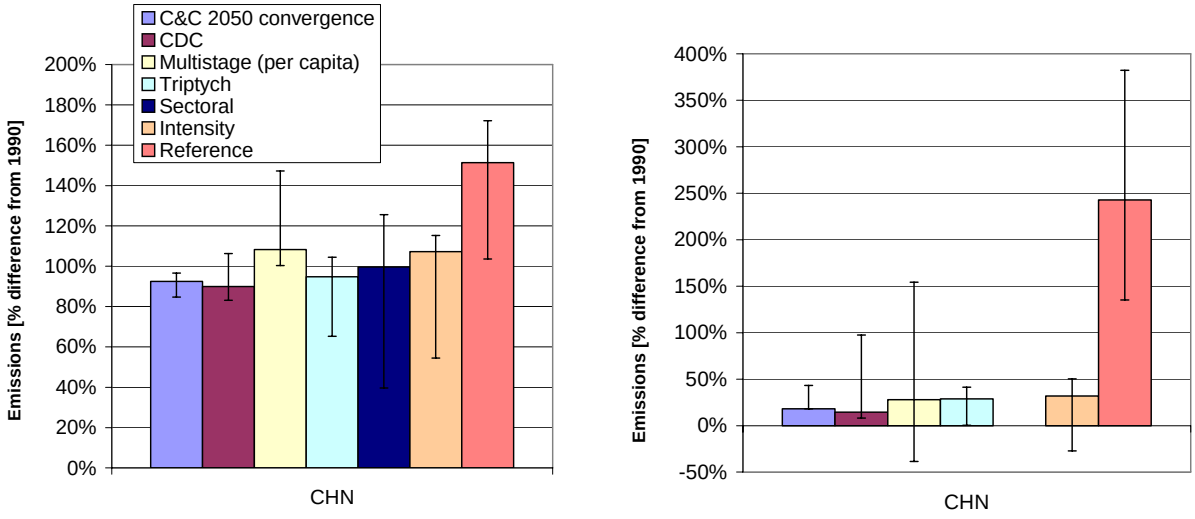


Figure 17. Emissions allowances according to the tested approaches to reach the 550 ppmv CO_2eq. development path for China in 2020 (left) and 2050 (right). Data are included in Appendix D, Table 31.

4.3 EU 25

The EU 25 is a mix of very diverse countries. The group ranks at around the average of Annex I countries. Per capita emissions are lower than Annex I average.

Figure 18 illustrates that emissions of EU 25 are expected to grow roughly by 10% by 2020 and less by 2050 above the 1990 level. Under all future scenarios calculated towards 550 ppmv CO_2eq. EU 25 would need to reduce emissions 20% to 30% below 1990 levels by 2020 and to -70% to -90% by 2050. Under C&C, emissions have to be reduced less than average due to the relatively low per capita emissions compared to other Annex I countries. For the CDC and multistage approach, earlier reductions are necessary to compensate for the additional emission growth in developing countries. This is particularly apparent for the multistage approach in 2050. The Triptych approach and intensity approach require about average reductions.

In conclusion: The reductions of the EU 25 by 2020 must be in the order of -20% to -30% in order to keep on track with the 550 ppmv CO_2eq. pathway. As this pathway is likely to exceed the 2°C goal of the EU, this can be seen as the upper bound. The difference between the approaches is relatively small, as the differences in national circumstances of the individual member states are averages over the total group. It would be in the interest of the EU to achieve participation of developing countries as early as possible to include the emission reduction potential in these countries in the international emission trading market to make emission reductions more cost effective.

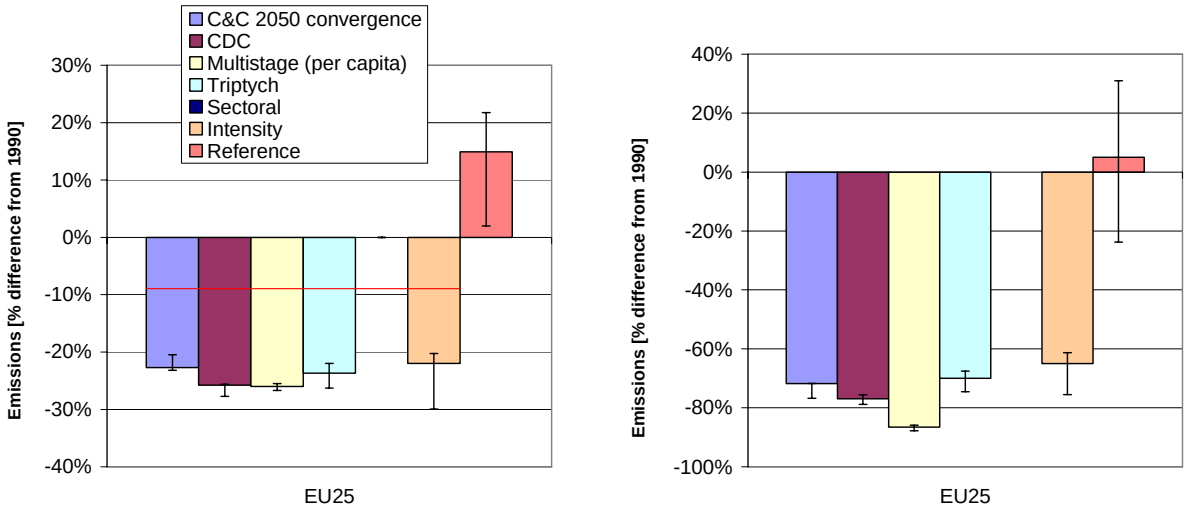


Figure 18. Emissions allowances according to the tested approaches to reach the 550 ppmv CO_2eq. development path for the EU 25 in 2020 (left) and 2050 (right). Data are included in Appendix D, Table 31.

4.4 INDIA

The basic data in the fact sheets illustrates that India ranks below average of developing countries with respect to its state of development. Emissions and GDP per capita are well below non-Annex I average.

India has experienced a strong economic and emission growth in the last 5 years. Growth rates are among the highest in the world but the starting point for all indicators is low. India uses a high share of residential traditional biomass and is strongly dependant on coal; its emissions per kWh electricity are among the highest in the world.

Figure 19 illustrates that emissions of India are expected to grow roughly by a factor of 2 by 2020 and factor of 5 to 10 by 2050 above the 1990 level. This would be a continuation of the steady growth experienced in the recent years. Under the staged scenarios (multistage and CDC) calculated towards

550 ppmv CO_2eq., India would not have to participate in 2020 due to its low per capita emissions and low state of development and emission could develop as under the reference case. Under Contraction and Convergence India would have emission constrains in the bandwidth of reference emissions in 2020. It would not receive excess emission allowances (hot air) but could still benefit from participation as emission reduction opportunities are available at lower cost than in many other countries. The Triptych approach and the sectoral approach require relatively strict emission limits for the electricity sector and therefore relatively stringent reductions below reference for India. The intensity target approach would also require more reductions as it is assumed that further development would be emission intensive and the reference improvement of emissions per GDP would have to be exceeded. In the long term until 2050, emissions could still grow by roughly a factor of 4 above 1990 levels, but less then the reference. Under the multistage even by 2050 the participation is very limited.

In conclusion: India is at the low end of development of the countries considered in this chapter. But due to its size and expected growth in the future, emission growth should be slowed as soon as possible. According to the indicators India would have the least capability of the countries considered in this chapter. Therefore the emission reductions have to be supported by other countries. If India would participate in the carbon market it can be expected that many of the reductions are financed through emission trading and project mechanisms, as the marginal emission reduction costs are very low compared to other countries. For example under Contraction and Convergence India would have to keep emissions roughly at reference and could have a net positive impact from the sale of emission allowances.

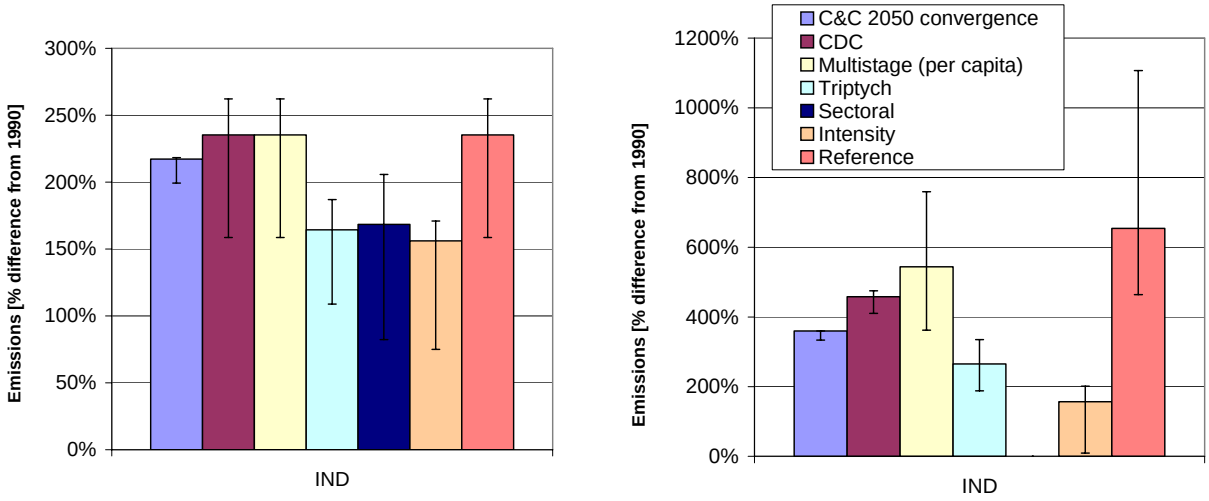


Figure 19. Emissions allowances according to the tested approaches to reach the 550 ppmv CO_2eq. development path for India in 2020 (left) and 2050 (right). Data are included in Appendix D, Table 31.

4.5 JAPAN

The basic data in the fact sheets illustrates that Japan ranks very high among Annex I with respect to its state of development, but relatively low with per capita emissions. Its population has been almost stable in the last decade. Its electricity system is largely based on nuclear power, making emissions per kWh very low. Its industrial sector makes up a large share of its emissions, but it is one of the most efficient in the world. Transport, household and waste emissions are high but below Annex I average, agricultural emissions are low.

Figure 20 and Figure 21 illustrate that emissions of Japan are expected to grow slowly but steadily until 2020 and may decrease again by 2050. Under all future scenarios calculated towards 550 ppmv CO_2eq. Japan would need to reduce its emissions well below its Kyoto target by 2020 and to 70% to 80% below

1990 level by 2050. Approaches based on per capita emissions (C&C, Figure 20, convergence of per capita emissions, Figure 21) or emissions per GDP convergence would be favourable to Japan compared to other approaches due to low emissions per capita and per GDP. Second best would be the Triptych approach and the sectoral approach that specifically consider the high efficiency of Japan and require less reduction. The historical responsibility approach requires about average reductions. The intensity target approach would the most stringent to Japan, as we assumed here the economic growth in Japan to be less than global average.

In conclusion: Japan has relatively low emissions due to high efficiency and the use of nuclear power compared to Annex I countries but still high compared to world average. Substantial reductions would be required under all approaches. Any approach that can take into account the high efficiency of the Japan's industry and the use of nuclear power would be favourable to Japan. Contrarily, any approach just based on the size of emissions would be less favourable and would result in more use of CDM/JI and international emission trading than most other Annex I countries.

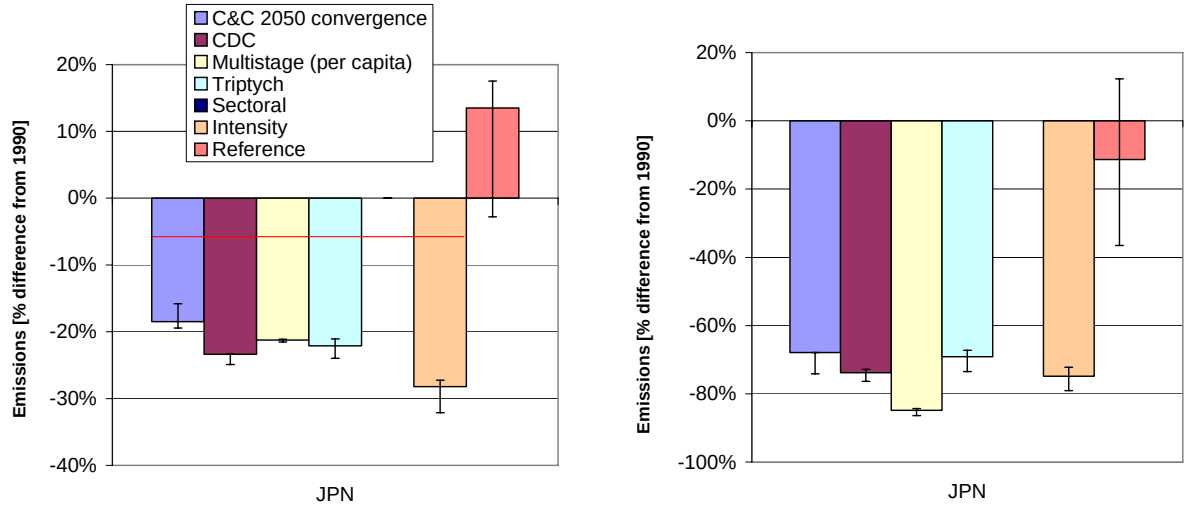


Figure 20. Emissions allowances according to the tested approaches to reach the 550 ppmv CO_2eq. development path for Japan in 2020 (left) and 2050 (right). Data are included in Appendix D, Table 31.

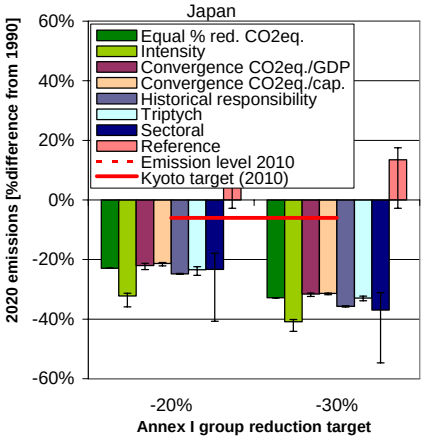


Figure 21. 2020 emissions allowances according to the sensitivity tests to reach -20% and -30% emissions compared to 1990 for Japan in 2050.

4.6 MEXICO

The basic data in the fact sheets illustrate that Mexico ranks very high among developing countries with respect to its state of development. Its GDP per capita is above that of most developing countries and is at above world average.

Mexico's emissions per capita are around world average and increasing. The energy system is dependant on oil and gas and emissions mostly occur in the electricity and transport sectors where emissions are well above world average. Emissions from land-use change are also substantial. At the same time a high reduction potential at comparatively low costs exists.

Figure 22 illustrates that emissions of Mexico are expected to grow roughly by a factor of 1.5 by 2020 and factor of 2 to 3 by 2050 above the 1990 level. Under all future scenarios calculated towards 550 ppmv CO_2eq. Mexico would need to slow the growth of emissions already by 2020 and reduce emissions thereafter to roughly 25% above 1990 emissions in 2050. With per capita emissions at world average, C&C and CDC approaches require early reductions. The multistage approach would grant Mexico more room to grow in the short term but would require reductions later on. The Triptych approach requires relatively strict emission limits for the electricity sector and therefore relatively stringent reductions below reference for Mexico, but still less strict than C&C and CDC. The sectoral approach requires most reductions in the electricity sector, where Mexico's emissions are high, but also in cement, irons & steel and pulp & paper, where Mexico's emissions are low. The intensity target approach would allow emission increase above average as Mexico's future GDP growth is expected to be above global average.

Emissions from deforestation are not included in these calculations, but constitute a substantial share of Mexico's emissions. Mexico can be expected to reduce these emissions substantially in the future.

In conclusion: Emissions from Mexico are substantial and according to the indicators Mexico would have more capability to act that most other developing countries. The extent to which emission reductions are supported by other countries is to be decided. If Mexico would participate in the carbon market it can be expected that some of the reductions are financed through emission trading and project mechanisms.

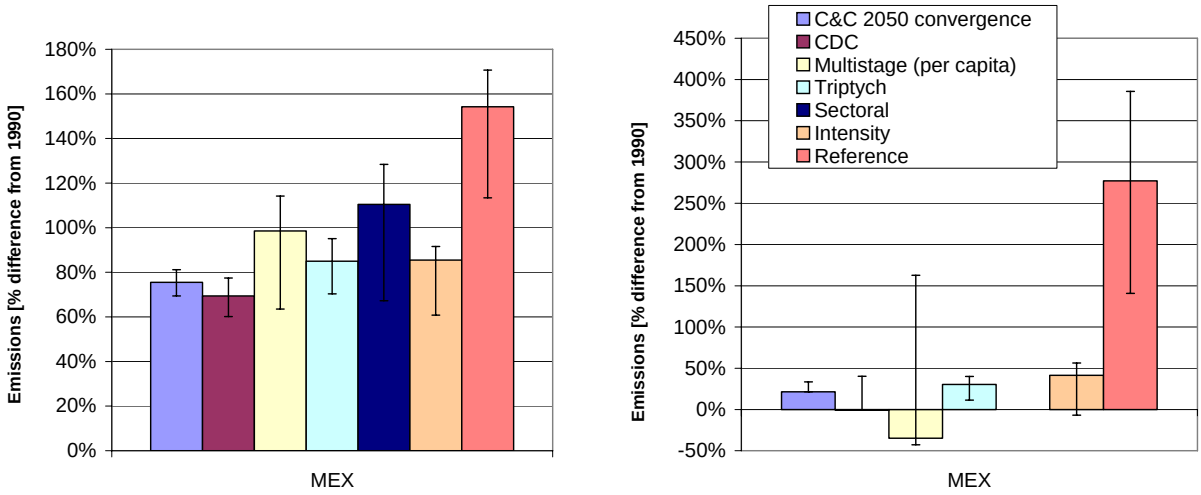


Figure 22. Emissions allowances according to the tested approaches to reach the 550 ppmv CO_2eq. development path for Mexico in 2020 (left) and 2050 (right). Data are included in Appendix D, Table 31.

4.7 RUSSIA

The basic data in the fact sheets illustrate that Russia ranks very low among Annex I countries with respect to its state of development. Its GDP per capita lies around world average. Its population has been almost stable in the last decade.

Russia's energy and emission intensity per GDP is very high. It's emissions per capita lie between world average and Annex I average due to the intensive use of gas. During the last years per capita emissions decreased. A large part of overall national emissions is produced in the electricity sector. Emissions from this sector are very high compared to the world, Annex I or non-Annex I average. So far, emissions from land-use change are very low, but substantial uncertainty exists for these estimates. They could become substantial with proceeding thawing of the permafrost soil. In general, data for Russia is very incomplete and in some cases more difficult to obtain than for many developing countries.

Figure 23 and Figure 24 illustrate that Russia's emissions have decreased substantially and are expected to increase again but well below 1990 levels in 2010 (dotted line) and in 2020 (last bar, Figure 24) and roughly reach 1990 level in 2050. Russia is assumed to reduce emissions far below its Kyoto target in 2010 already in the business-as-usual case. To achieve actual emission reductions for Russia, which is one of the largest emitters in the world, more stringent reductions than required under the Kyoto Protocol would be needed. This case demonstrates the importance of the starting point in 2012 (2010 in this case).

Under all future scenarios calculated towards 550 ppmv CO_2eq. Russia would therefore need to reduce its emissions far below its 1990 level. Approaches based on equal reduction of emissions/GDP would be favourable to Russia compared to other approaches because high GDP growth rates are assumed compared to other Annex I countries. The Intensity approach would lead to emission reductions of 20% to 40% below 1990 level in 2020 and 30% to 60% below 1990 level until 2050. Second best would be the Triptych approach as it also relies on the stronger growth assumed for Russia compared to other Annex I countries. Convergence of emissions per GDP would be more stringent as current emissions per GDP are high, but this is compensated by the assumed strong GDP growth, resulting in average reductions for this approach. Also historical responsibility and convergence of per capita emissions require average reductions. As for nearly all Annex I countries, the Multistage approach would lead to the most stringent reduction efforts to compensate that many developing countries only participate at a late point in time.

In conclusion: Russia has relatively high emissions due to low efficiency compared to Annex I countries. Considering the actual emission level in 2010 instead of the Kyoto target significant reductions would be required under all approaches. An exception could be the Intensity approach with the parameters used here. This demonstrates that approaches taking into account the GDP growth could be favourable to Russia. Contrarily, any approach just based on the size of emissions would be less favourable.

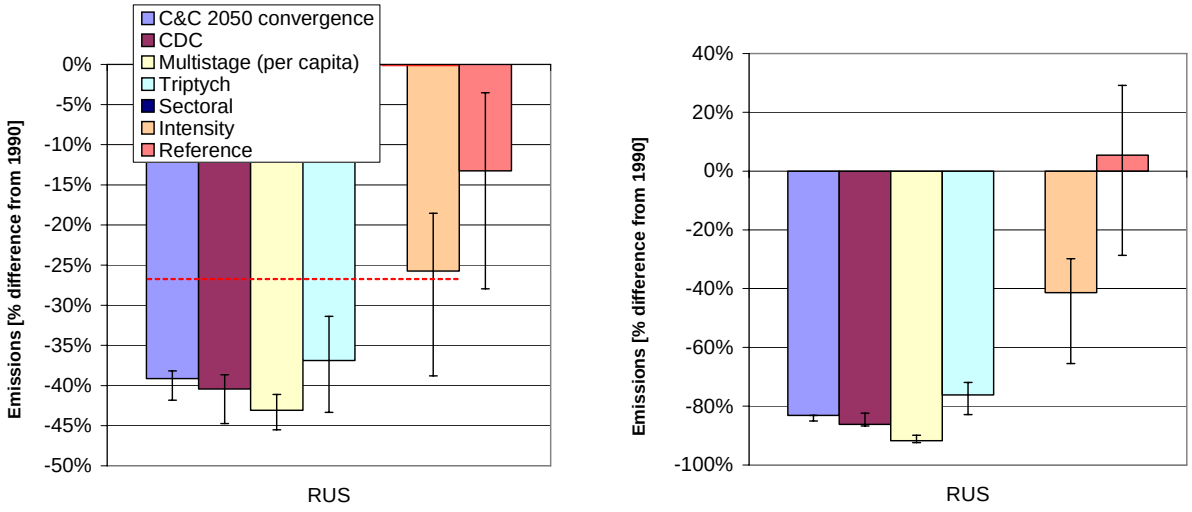


Figure 23. Emissions allowances according to the tested approaches to reach the 550 ppmv CO_2eq. development path for Russia in 2020 (left) and 2050 (right). The dotted line is the 2010 level. Data are included in Appendix D, Table 31.

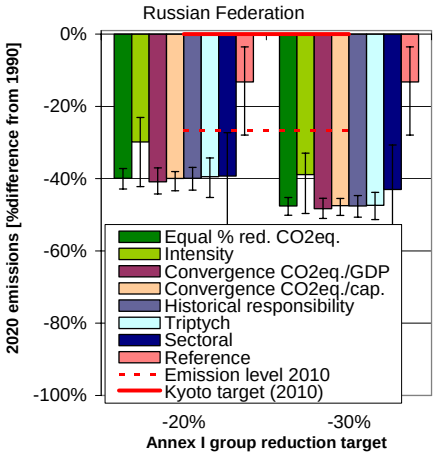


Figure 24. 2020 emissions allowances according to the sensitivity tests to reach -20% and -30% emissions compared to 1990 for Russia in 2050.

4.8 SOUTH AFRICA

The basic data in the fact sheets illustrates that South Africa ranks above the average of developing countries with respect to its state of development. Its emissions and GDP per capita are well above world average. Its emissions per capita are close to Annex I average.

South Africa is strongly dependant on coal, which makes up ¾ of its energy use. Coal is available at relatively low cost within the country. South Africa's emissions per kWh electricity are among the highest in the world. Its emissions per capita are close to Annex I average, but have only increase slightly in the last 10 years.

Figure 25 illustrates that emissions of South Africa are expected to grow roughly by a factor of 0.8 to 1 by 2020 and factor of 2 to 3 by 2050 above the 1990 level. Under all future scenarios calculated towards 550 ppmv CO_2eq. South Africa would need to slow the growth of emissions already by 2020 and reduce emissions thereafter to roughly 1990 level in 2050. As under C&C have to be reduced below current non-Annex I average, South Africa needs to reduce emissions early under this approach. The CDC approach would grant South Africa more room to grow in the short term, but requires more reductions in the long term. In a multistage, South Africa would move very quickly into higher stages and would have to slow emission growth significantly. The sectoral approach as implemented here relies on strict emission limits for the electricity sector and therefore relatively stringent reductions for South Africa. The triptych approach is less stringent for South Africa. The intensity target approach would allow emission increase above average as South Africa's future GDP growth is expected to be well above global average.

In conclusion: The size and the strong dependence of coal of South Africa make it necessary to slow its emissions growth already by 2020. According to the indicators South Africa would have higher capability than most developing countries. The extent to which emission reductions are supported by other countries is to be decided. If South Africa would participate in the carbon market it can be expected that some of the reductions are financed through emission trading and project mechanisms.

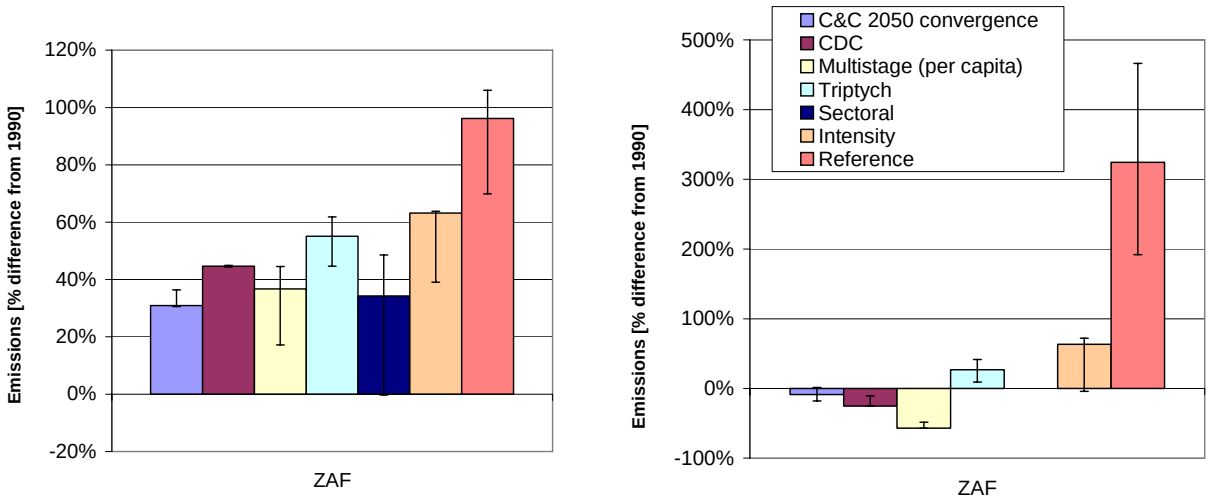


Figure 25. Emissions allowances according to the tested approaches to reach the 550 ppmv CO_2eq. development path for South Africa in 2020 (left) and 2050 (right). Data are included in Appendix D, Table 31.

4.9 SOUTH KOREA

The basic data in the fact sheets illustrates that South Korea ranks very high among developing countries with respect to its state of development. Its GDP per capita and emissions per capita are well above that of most developing countries and above world average.

South Korea's is in its state of development very close or even similar to some Annex I countries: Its population has been almost stable in the last decade. Its electricity system is largely based on nuclear power, making emissions per kWh very low. Its industrial sector makes up a large share of its emissions, but it is one of the most efficient in the world. Transport and household emissions are high, agricultural emissions are not relevant.

Figure 26 illustrates that emissions of South Korea are expected to grow roughly by a factor of 2 by 2020 and factor of 4 to 6 by 2050 above the 1990 level. Under all future scenarios calculated towards 550 ppmv CO_2eq. South Korea would need to slow the growth of emissions already by 2020 and reduce emissions thereafter to 1990 level or below in 2050. With per capita emissions above world average, C&C and CDC approaches as well as the multistage approach require early slowing of emissions growth by 202 and significant reduction below 1990 in 2050. The Triptych approach and the sectoral approach specifically consider the very high efficiency of South Korea and require less reduction, but still a development below reference until 2020. The intensity target approach would allow emission increase above average as South Korea's future GDP growth is expected to be above global average.

In conclusion: South Korea is in its state of development very similar to some Annex I countries. According to the indicators South Korea would also have more capability to act that most other developing countries. The extent to which emission reductions are supported by other countries is to be decided. If South Korea would participate in the carbon market it can be expected that some of the reductions are financed through emission trading and project mechanisms. Any approach that can take into account the exceptionally high efficiency of the South Korean industry would be favourable to Korea. Contrarily, any approach just based on the size of emissions would be less favourable.

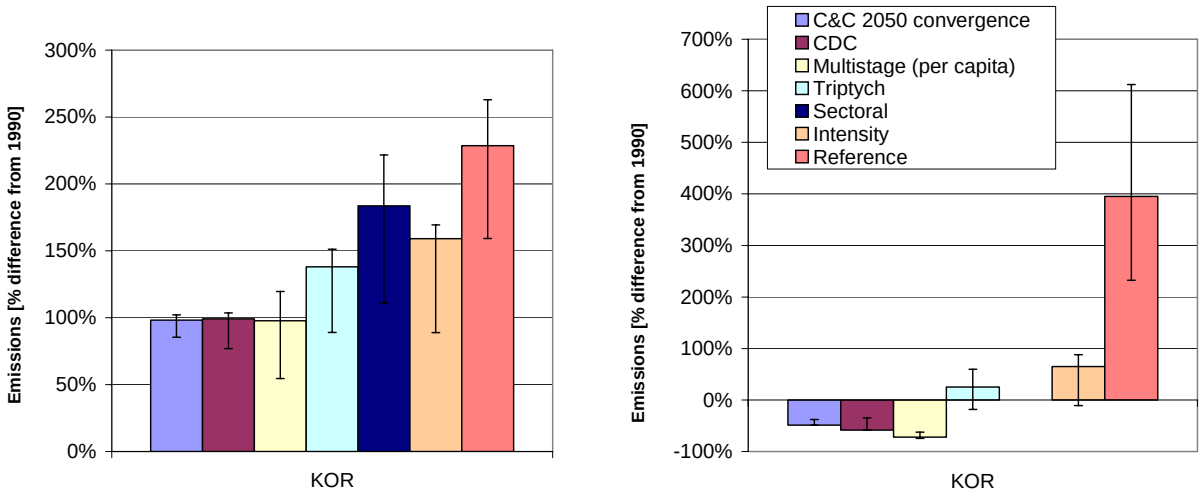


Figure 26. Emissions allowances according to the tested approaches to reach the 550 ppmv CO_2eq. development path for South Korea in 2020 (left) and 2050 (right). Data are included in Appendix D, Table 31.

4.10 USA

The basic data in the fact sheets illustrate that USA ranks very high among Annex I countries with respect to its state of development. Its GDP per capita is among the highest in the world.

Emissions of the USA are very high: Emissions have steadily increased since 1990 and are expected to steadily increase further. Per capita emissions are among the highest in the world, emissions from transport, households and waste are particularly high.

The emission allowances for 2020 strongly depend on the assumption of the starting point in 2010. The large difference between the Kyoto target (7% below 1990 level) and the national target (assumed here to be 23% above 1990 level) influences the results significantly. This highlights the importance of the political decision of the starting point of the USA, once it returns to an international climate regime.

Figure 27 and Figure 28 illustrate that the reference emissions for the USA in 2020 (last bar) are very similar to the national target (dotted line). No substantial further increase is expected until 2050 (last bar, Figure 27). Under all future scenarios calculated towards 550 ppmv CO_2eq. USA would need to reduce its emissions far below its 2010 level. Approaches based on equal reduction of emissions/GDP would be less favourable to USA compared to other approaches because less GDP growth is assumed compared to other Annex I countries. Convergence of emissions per capita would also be demanding because of the current high levels. Emissions per GDP are world and annex I average, hence reductions under convergence of emissions per GDP are average. Least demanding would be the historical responsibility approach as the USA has less historical emissions compared to other countries. The Triptych approach is demanding as it reveals the high per capita emissions and the relatively low efficiency compared to other annex I countries. As for nearly all Annex I countries, the Multistage approach would lead to the most stringent reduction efforts to compensate that many developing countries only participate at a late point in time. In the here implemented form it is particularly stringent as it requires countries with high per capita emissions to reduce more and the USA has highest per capita emissions within Annex I. Also the sectoral approach is very demanding as it relies mainly on the electricity sector, which is very significant for the USA. The calculations are however based on a different method and cannot directly be compared with the other results.

In conclusion: As the largest emitter with very high emissions per capita and very high GDP per capita, USA would need to reduce its emissions substantially under all approaches. The differences between the approaches are relatively small. The starting point from which the USA participates is most important. It would be favourable for the USA to argue for a high staring point or an approach that is based on

historical responsibility. Actual emission reductions would be less costly in the USA compared to EU or Japan as the general efficiency is lower in the USA and therefore the marginal reduction cost should be lower.

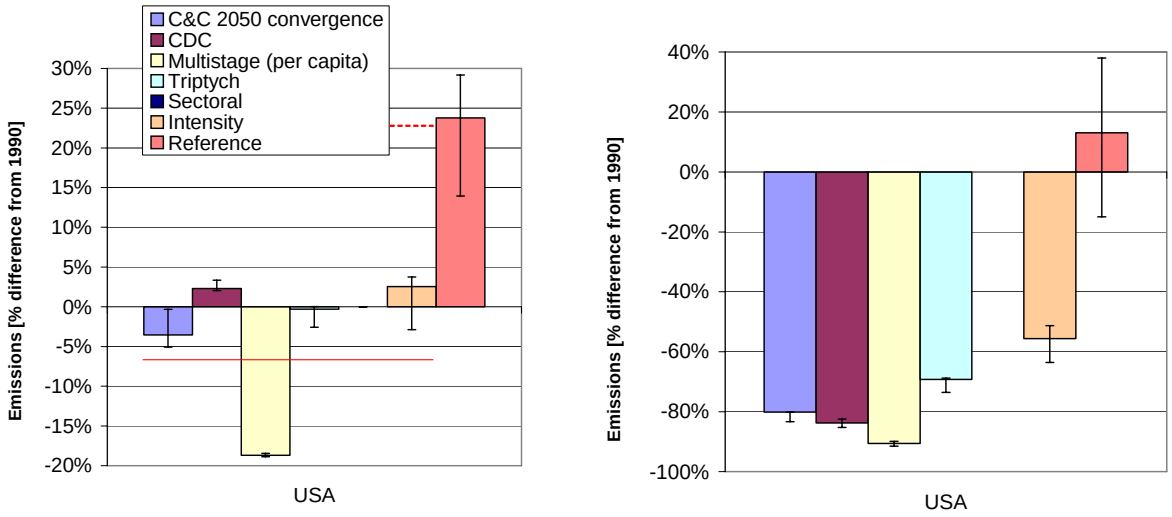


Figure 27. Emissions allowances according to the tested approaches to reach the 550 ppmv CO_2eq. development path for the USA in 2020 (left) and 2050 (right). Dotted line is the national target, full line is the Kyoto target. Data are included in Appendix D, Table 31.

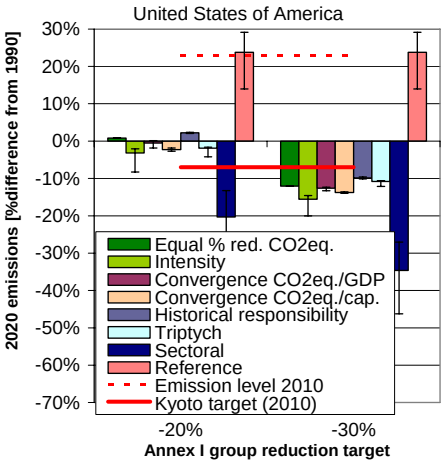


Figure 28. 2020 emission allowances according to the sensitivity tests to reach -20% and -30% emissions compared to 1990 for the USA in 2050

5. CONCLUSIONS

The objective of this report is to provide an analytical basis to underpin discussions on future commitments to reduce greenhouse gas (GHG) emissions at the end of the first Kyoto Protocol commitment period (i.e. post-2012).

It provides (1) fact sheets with detailed data for 60 countries and (2) calculations of the implications of future climate regime architectures on emission allowances on a country level.

The fact sheets provide emissions and underlying drivers on a detailed level as well as a summary of the policies by these countries. They show that countries are very diverse. Almost all of the countries considered have a characteristic that is unique. In particular small countries have specific national circumstances, e.g. New Zealand with a very large share of emissions from agriculture or Denmark with large inter-annual variations in emissions due to varying electricity trade. But also large countries are unique, such as Brazil with a major share of hydropower in electricity generation and biofuels in transport but very high emissions in agriculture, Canada with large inter-annual variations of emissions from land-use change and forestry or France with a very high share of nuclear power.

The fact sheets provide the differences between countries graphically at a glance. The accompanying spreadsheet tables provide numerical information for detailed analysis.

From the exercise of gathering the data we discovered major data gaps which could be areas of further work:

- The potential and costs of emission reductions is not readily available for individual countries. It may exist for several countries but it is not provided in a consistent form.
- Emission inventory data for developing countries exists but is only reported to the UNFCCC for the year 1994. Other international sources may be inconsistent with what is reported to the UNFCCC.
- Detailed sectoral data is not available for all countries. E.g. energy use and emissions from cement production cannot be easily extracted from available sources, in particular for developing countries
- Data for former members of the Soviet Union is usually less available than for major non-Annex I countries.

In the second part of the report we assessed implications of different future climate change regime architectures on countries' emission allowances. Three levels of ambition 450, 550 and 650 ppmv CO_2eq. were explored for 2020 and 2050. We calculated emission allowances (before trading) on a country level and assessed the difference between various approaches. We also provided a sensitivity analysis for alternative ways to share emission allowances among Annex I countries.

We draw the following general conclusions from this work:

- *Emissions need to be reduced:* Significant reductions below 1990 levels for all approaches and stabilisation levels are necessary from developed countries in addition to early deviation from reference in developing countries.
- *The choice of the stabilisation level is of major importance:* The difference in reductions between stabilisation targets (450, 550 and 650 ppmv CO_2eq.) is usually larger than the difference between the various approaches aiming at one stabilisation target for most countries.
- *Differences between approaches are small:* For most countries the differences in emission allowances between different approaches is relatively small compared to the overall reduction effort, especially in the long term. For some developed countries the difference may be larger, because of specific national circumstances. For some developing countries it may be larger because they participate early under one approach and much later under another approach.
- *The starting point in 2010 is of major importance for Annex I countries:* We assumed here that Annex I countries' future targets are based on their Kyoto targets in 2010. Exceptions are made for the USA with their national target (assumed here to be 23% above 1990 level) and for the economies in transition with their reference emissions in 2010 (below the Kyoto target). This

ultimately political decision influences the results more for these countries than the choice of the future approach.

- *Only a compromise approach can be equally appealing to all countries:* We tested several approaches varying from very simple (equal percentage reduction) to very complex (Triptych or sectoral approach). Each approach is more attractive for some and less attractive for others. A simple approach can therefore only act as a general guide of direction, but the final agreement is likely to be based on a complex formula or ultimately a compromise. The multistage approach provides the opportunity to accommodate many ideas into a compromise.

The final agreement on an international climate change regime will be a multi-faceted, multi-staged or multi-layered system arising from an iterative process of countries proposing and assessing each others proposals. The data provided in this report intends to provide some insights to guide countries in such a process.

REFERENCES

Andronova, N. and M.E. Schlesinger. (2004). Importance of Sulfate Aerosol in Evaluating the Relative Contributions of Regional Emissions to the Historical Global Temperature Change. *Mitigation and Adaptation Strategies for Global Change, 9* (4), 383 - 390.

Baumert, K. A., R. Bhandari and N. Kete. (1999). *What might a developing country climate commitment look like?* Washington DC: World Resources Institute.

Berk, M.M. and M.G.J. den Elzen. (2001). Options for differentiation of future commitments in climate policy: how to realise timely participation to meet stringent climate goals? *Climate Policy, 1* (4), 465-480.

Blanchard, O., C. Criqui, A. Kitous and L. Vinguier. (2003). Efficiency with equity: A prgamatic Approach. In Kaul, I., P. Conceiçäo, K. Le Goulven and R.U. Mendoza (Eds.), *Providing public goods: managing globalization*. Grenoble, France: Oxford: Oxford Universitty Press: Office of Devlopment Studies, United Nations Devleopment Program.

Blok, K. , N. Höhne, A. Torvanger and R. Janzic. (2005). *Towards a Post-2012 Climate Change Regime.* Brussels, Belgium: 3E nv. http://europa.eu.int/comm/environment/climat/pdf/id_bps098.PDF.

Blok, K., G.J.M. Phylipsen and J.W. Bode. (1997). *The Triptique approach. Burden differentiation of CO_2 emission reduction among European Union member states. Discussion paper*. Utrecht University, Department of Science, Technology and Society. Paper presented at the Informal workshop for the European Union Ad Hoc Group on Climate, 16-17 January 1997, Zeist.

Bouille, Daniel and Osvaldo Girardin. (2002). Learning from the Argentine Voluntary Commitment. In Baumert, Kevin A. (Ed.), *Options for Protecting the Climate*. Washington D.C.: World Resource Institute.

CAN, (Climate Action Network). (2003). *Preventing dangerous climate change.* CAN position paper presented at COP 9. Milan, Italy: Climate Action Network. http://www.climnet.org.

CDIAC. (2005). Global, Regional, and National Fossil Fuel CO_2 Emissions. In Marland, G., T.A. Boden and R. J. Andres (Eds.), *A Compendium of Data on Global Change*. Oak Ridge, Tenn., USA: Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, U.S. Department of Energy. http://cdiac.esd.ornl.gov/trends/emis/meth_reg.htm.

Chan-Woo, Kim. (2002). Negotiations on Climate Change: Debates on Commitment of Developing Countries and Possible Responses. *East Asian Review, 14*, 42-60.

Claussen, E. and L. McNeilly. (1998). *Equity and Global Climate Change, The Complex Elements of Global Fairness.* Table of models. PEW Centre on Global Climate Change, Arlington: http://www.pik-potsdam.de/data/emic/table_of_emics.pdf.

Criqui, P., A. Kitous, M.M. Berk, M.G.J. den Elzen, B. Eickhout, P. Lucas, D.P. van Vuuren, N. Kouvaritakis and D. Vanregemorter. (2003). *Greenhouse gas reduction pathways in the UNFCCC Process up to 2025 - Technical Report.* No. B4-3040/2001/325703/MAR/E.1 for the DG Environment. Grenoble, France: CNRS-IEPE. http://europa.eu.int/comm/environment/climat/pdf/pm_techreport2025.pdf.

den Elzen, M.G.J. (2005). *Analysis of future commitments and costs of countries for the "South-North Dialogue" Proposal using the FAIR 2.1 world model.* No. MNP-report 728001032 (www.mnp.nl/en) Netherlands Environmental Assessment Agency (MNP), Bilthoven, the Netherlands.

den Elzen, M.G.J., M.M. Berk, P. Lucas, B. Eickhout and D.P. van Vuuren. (2003). *Exploring climate regimes for differentiation of commitments to achieve the EU climate target.* No. MNP-report 728001023. Bilthoven, the Netherlands: Netherlands Environmental Assessment Agency (MNP).

den Elzen, M.G.J., J. S. Fuglestvedt, N. Höhne, C.M. Trudinger, J. Lowe, B.J.H. Matthews, B. Romstadt, C. Pires de Campos and N. Andranova. (2005a). Analysing countries' contribution to climate change: Scientific uncertainties and methodological choices. *Environmental Science Policy, 8*, 614-636. http://www.sciencedirect.com/science?_ob=ArticleURL&_aset=V-WA-A-W-B-MsSAYZW-UUA-U-AACAZZUYEC-AAVEWVAZEC-EUVVVUDAW-B-U&_rdoc=1&_fmt=summary&_udi=B6VP6-4H68P03-1&_coverDate=12%2F31%2F2005&_cdi=6198&_orig=search&_st=13&_sort=d&view=c&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=97870dbdf722b5363079ed0417c6f74b.

den Elzen, M.G.J., N. Höhne, B. Brouns, H. Winkler and H E. Ott. (2005b). Differentiation of countries' post-2012 mitigation commitments under the "South-North Dialogue" Proposal. *Global Environmental Change, (submitted)*.

den Elzen, M.G.J. and P. Lucas. (2003). *FAIR 2.0: a decision-support model to assess the environmental and economic consequences of future climate regimes.* No. MNP-report 550015001, www.mnp.nl/fair. Bilthoven, the Netherlands: Netherlands Environmental Assessment Agency (MNP).

den Elzen, M.G.J. and M. Meinshausen. (2005). *Meeting the EU 2°C climate target: global and regional emission implications.* MNP-report, No. 728001031. Bilthoven, the Netherlands: Netherlands Environmental Assessment Agency (MNP). http://www.gci.org.uk/briefings/rivm.pdf.

den Elzen, M.G.J. and M. Schaeffer. (2002). Responsibility for past and future global warming: uncertainties in attributing anthropogenic climate change. *Climatic change, 54*, 29-73.

den Elzen, M.G.J., M. Schaeffer and B. Eickhout. (2002). *Responsibility for past and future global warming: time horizon and non-linearities in the climate system.* No. MNP-report 728001022. Bilthoven, the Netherlands: Netherlands Environmental Assessment Agency (MNP).

den Elzen, M.G.J., M. Schaeffer and P. Lucas. (2005c). Differentiating future commitments on the basis of countries' relative historical responsibility for climate change: uncertainties in the 'Brazilian Proposal' in the context of a policy implementation. *Climatic Change, 71* (3), 277-301.

den Elzen, Michel G.J., Paul Lucas Marcel Berk, Patrick Criqui and Alban Kitous. (2006). Multi-Stage: A Rule-Based Evolution of Future Commitments Under the Climate Change Convention. *International Environmental Agreements: Politics, Law and Economics 6*(1), 1 - 28 http://springerlink.metapress.com/(s4bu3sqizksn1155wrtngojy)/app/home/contribution.asp?referrer=parent&backto=issue,1,6;journal,2,22;linkingpublicationresults,1:106601,1.

Eickhout, B., M.G.J. den Elzen and D.P. van Vuuren. (2003). *Multi-gas emission profiles for stabilising greenhouse gas concentrations.* No. MNP-report 728001026. Bilthoven, the Netherlands: Netherlands Environmental Assessment Agency (MNP). www.mnp.nl\en.

Ellerman, A. Denny and Ian Sue Wing. (2003). Absolute versus intensity-based emission caps. *Climate Policy, 3* (Supplement 2), S7-S20. http://www.sciencedirect.com/science/article/B6W88-4B2C2NX-5/2/dc87901a470fb86453f15b03311703f8.

EU Council. (1996). *Communication on Community Strategy on Climate Change, Council Conclusions.* European Council, Brussels.:

FAOSTAT. (2006). *FAOSTAT statistical databases.* Food and Agriculture Organisation of the United Nations. http://faostat.fao.org/site/381/default.aspx.

FRA. (2005). *FAO from Global Forest Resources Assessment 2005.* http://geosdata.grid.unep.ch/

GCI. (2005). *GCI Briefing: Contraction & Convergence.* Retrieved April, 2006. Global Commons Institute. http://www.gci.org.uk/briefings/ICE.pdf.

Groenenberg, H. (2002). *Development and Convergence: a bottom-up analysis for the differentiation of future commitments under the Climate Convention.* Unpublished PhD, Utrecht University, Utrecht, the Netherlands.

Gupta, J. (1998). *Encouraging developing country participation in the climate change regime.* Discussion Paper E98-08. Institute for Environmental Studies, Free University of Amsterdam, Amsterdam, the Netherlands:

Gupta, J. (2003). Engaging Developing Countries in Climate Change: KISS and Make-Up! In Michel, D. (Ed.), *Beyond Kyoto: Meeting the Long-Term Challenge of Global Climate Change*: the Johns Hopkins University Center for Transatlantic relations, Transatlantic Dialogue on Climate Change.

Hare, W.L. and M. Meinshausen. (2004). *How much warming are we committed to and how much can be avoided?* Briefing Paper. Potsdam Institute for Climate Impact Research (PIK), Potsdam, Germany:

Hargrave, Tim, Ned Helme and Christine Vanderlan. (1998). *Growth Baselines.* Washington, D.C., USA: Center for Clean Air Policy.

Höhne, Niklas. (2006). *What is next after the Kyoto Protocol? Assessment of options for international climate policy post 2012*. Amsterdam, The Netherlands: Techne Press. http://www.technepress.nl/publications.php?id=13.

Höhne, Niklas and Kornelis Blok. (2005). Calculating Historical Contributions To Climate Change - Discussing The 'Brazilian Proposal'. *Climatic Change, 71* (1), 141-173. http://www.springerlink.com/openurl.asp?genre=article&id=doi:10.1007/s10584-005-5929-9.

Höhne, Niklas and Kornelis Blok. (2006). The impact of the Kyoto Protocol on climate stabilization. In *What is next after the Kyoto Protocol? Assessment of options for international climate policy post 2012*. Amsterdam, The Netherlands: Techne Press. http://www.technepress.nl/publications.php?id=13.

Höhne, Niklas, Kornelis Blok, Jochen Harnisch, Dian Phylipsen and Carolina Galleguillos. (2003). *Evolution of commitments under the UNFCCC: Involving newly industrialized countries and developing countries.* No. Research-report 20141255, UBA-FB 000412. Berlin: ECOFYS Gmbh.

Höhne, Niklas, M.G.J. den Elzen and M. Weiss. (2006a). Common but differentiated convergence (CDC), a new conceptual approach to long-term climate policy. *Climate Policy, 6*, 181-199.

Höhne, Niklas, Sara Moltmann, Esther Lahme, Ernst Worrell and Wina Graus. (2006b). *CO_2 emission reduction potential under a sectoral approach post 2012.* For the Netherlands Environmental Assessment Agency (MNP), No. DM70210. Cologne, Germany: Ecofys.

Höhne, Niklas, Dian Phylipsen, Simone Ullrich and Kornelis Blok. (2005a). *Options for the second commitment period of the Kyoto Protocol, research report for the German Federal Environmental Agency.* Climate Change 02/05, ISSN 1611-8855. Berlin: ECOFYS GmbH. http://www.umweltdaten.de/publikationen/fpdf-l/2847.pdf.

Höhne, Niklas and Simone Ullrich. (2005). *Emission allowances under the proposal of the "South north dialogue - equity in the greenhouse".* No. Research-report DM 70096. Cologne, Germany: ECOFYS.

Höhne, Niklas, Sina Wartmann and Wina Graus. (2005b). *WWF climate scorecards - comparison of the climate performance of the G8 countries.* Washington DC, USA: World Wildlife Fund for Nature. http://www.panda.org/downloads/climate_change/g8scorecardsjun29light.pdf.

Houghton, R.A. (2003). *Emissions (and Sinks) of Carbon from Land-Use Change. (Estimates of national sources and sinks of carbon resulting from changes in land use, 1950 to 2000).* Report to the World Resources Institute from the Woods Hole Research Center. Woods Hole, Massachusetts, USA: Woods Hole Research Center. http://cait.wri.org.

IEA. (2002a). *CO_2 Emissions from Fuel Combustion (2002 edition).* Paris, France: International Energy Agency, Available online at: http://data.iea.org/ieastore/co2_main.asp.

IEA. (2002b). *World Energy Outlook 2002*. Paris: International Energy Agency.

IEA. (2003). *World Energy Investment Outlook, 2003 Insights.* Paris: International Energy Agency.

IEA. (2004). *World Energy Outlook 2004*. Paris: International Energy Agency.

IEA. (2005a). *CO_2 Emissions from Fuel Combustion (2005 edition)*. Paris, France: International Energy Agency. http://data.iea.org/ieastore/co2_main.asp.

IEA. (2005b). *Energy balances.* CD database. Paris: International Energy Agency.

IEA. (2006). *CO_2 Emissions from Fuel Combustion (2006 edition)*. International Energy Agency. http://www.iea.org/w/bookshop/add.aspx?id=36.

IISI. (1995-2004). *Iron and Steel statistical yearbook.* Brussels, Belgium: International Iron and Steel Institute. http://www.worldsteel.org.

IMAGE team. (2001). *The IMAGE 2.2 implementation of the SRES scenarios. A comprehensive analysis of emissions, climate change and impacts in the 21st century.* CD-ROM publication 481508018. Bilthoven, the Netherlands: http://www.rivm.nl/image/.

IPCC. (2007a). *Climate Change 2007. Mitigation of climate Change.* IPCC Assessment Reports. Geneva, Switzerland: Working Group III, IPCC Secretariat (International Panel on Climate Change). http://www.ipcc.ch.

IPCC. (2007b). *Climate Change 2007.The Physical Science Basis.* IPCC Assessment Reports. Geneva, Switzerland: Working Group I, IPCC Secretariat (International Panel on Climate Change). http://www.ipcc.ch.

IRF. (2005). *World road statistics 2005.* Geneva, Switzerland: International Road Federation.

Jotzo, Frank and John C.V. Pezzey. (2005). *Optimal intensity targets for emissions trading under uncertainty.* Draft. Canberra, AU: Centre for Resource and Environmental Studies - Australian National University.

Kolstad, C.D. (2006). The Simple Analytics of Greenhouse Gas Emission Intensity Reduction Targets. *Energy Policy*, (forthcoming).

Kuramochi, Takeshi. (2006). *Greenhouse gas emissions reduction based on a bottom-up approach: Focus on industrial energy efficiency benchmarking and future industrial activity indicators.* Utrecht: University of Utrecht.

La Rovere, E., S.K. Ribeiro and K.A. Baumert. (2002). The Brazilian Proposal on relative responsibility for global warming. In Baumert, K.A., O. Blanchard, S. Llose and J.F. Perkaus (Eds.), *Options for protecting the climate*. Washington: World Rewsource Institute (WRI).

Lisowski, Michael. (2002). The emperor's new clothes: redressing the Kyoto Protocol. *Climate Policy, 2* (2-3).

Lutter, Randal. (2000). Developing Countries' Greenhouse Emissions: Uncertainty and Implications for Participation in the Kyoto Protocol. *The Energy Journal, 21* (4).

Marland, G., T.A. Boden and R. J. Andres. (2003). Global, Regional, and National Fossil Fuel CO_2 Emissions. In Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, U.S. Department of Energy (Ed.), *Trends: A Compendium of Data on Global Change*. Oak Ridge, Tennesse., U.S.A. Available online at: http://cdiac.esd.ornl.gov/trends/emis/meth_reg.htm.

Meinshausen, M. (2004). Emissions, Targets and Projections for Annex I Parties. In Yamin, F. and Joanna Depledge (Eds.), *The International Climate Change Regime: A Guide to Rules, Institutions and Procedures*. Cambridge: Cambridge University Press.

Meinshausen, Malte. (2005). *On the risk of overshooting 2°C.* Paper presented at the Scientific Symposium "Avoiding Dangerous Climate Change", MetOffice, Exeter, 1-3 February 2005. http://www.stabilisation2005.com/.

Meira Filho, L.G. and J.D. Gonzales Miguez. (2000). *Note on the time-dependant relationship between emissions of greenhouse gases and climate change.* Brasilia, Brazil: Ministry of Science and Technology, Federal Republic of Brazil. http://www.mct.gov.br/clima.

Meyer, Aubrey. (2000). *Contraction & convergence. The global solution to climate change.* Schumacher Briefings, No. 5. Bristol, UK:

Michaelowa, A., S. Butzengeiger and M. Jung. (2005). Graduation and Deepening: An Ambitious Post-2012 Climate Policy Scenario, *International Environmental Agreements: Politics, Law and Economics* (Vol. 5, pp. 25-46).

Müller, B., M. Michealowa and C. Vrolijk. (2001). *Rejecting Kyoto: a study of proposed alternatives to the Kyoto Protocol.* Oxford: Climate Strategies International Network for Climate Policy Analysis. Oxford Institute for Energy Analysis.

Müller, Benito and Georg Müller-Fürstenberger. (2003). *Price-related Sensitivities of Greenhouse Gas Intensity Targets.* mimeo Oxford Energy Institute.

Nakicenovic, N., J. Alcamo, G. Davis, B. de Vries, J. Fenhann, S. Gaffin, K. Gregory, A. Grübler, T.Y. Jung, T. Kram, E. Emilio la Rovere, L. Michaelis, S. Mori, T. Morita, W. Pepper, H. Pitcher, L. Price, K. Riahi, A. Roehrl, H. Rogner, A. Sankovski, M. Schlesinger, P. Shukla, S. Smith, R. Swart, S. van Rooyen, N. Victor and Z. Dadi. (2000). *Special report on emissions scenarios*. IPCC Special Reports. Cambridge, UK: Cambridge University Press.

OECD. (2006). *OECD Factbook 2006: Economic, Environmental and Social Statistics.* Organisation for Economic Cooperation and Development. http://titania.sourceoecd.org/vl=673981/cl=25/nw=1/rpsv/factbook/.

OECD/IEA. (2002). *Beyond Kyoto, Energy dynamics and climate stabilisation*. Paris: OECD.

Olivier, J.G.J. and J.J.M. Berdowski. (2001). Global emissions sources and sinks. In Berdowski, J., R. Guicherit and B.J. Heij (Eds.), *The Climate System* (pp. 33-78): A.A. Balkema Publishers/Swets & Zeitlinger Publishers, Lisse, The Netherlands. ISBN 90 5809 255 0.

Ott, H E., H. Winkler, B. Brouns, S. Kartha, M. Mace, S. Huq, Y. Kameyama, A.P. Sari, J. Pan, Y. Sokona, P.M. Bhandari, A. Kassenberg, E.L. La Rovere and A. Rahman. (2004). *South-North dialogue on equity in the greenhouse. A proposal for an adequate and equitable global climate agreement.* S. Eschborn, Gesellschaft für Technische Zusammenarbeit, www.erc.uct.ac.za/recentpub.htm or www.south-north-dialogue.net.

Phylipsen, Dian, Niklas Höhne and Robert Janzic. (2004). *Implementing Triptych 6.0 - Technical report.* Project, No. DM70046 and ICC03080. Utrecht, The Netherlands: Ecofys. http://www.ecofys.com/com/publications/documents/EcofysTriptych6.0.pdf.

Phylipsen, G.J.M., J.W. Bode, K. Blok, H. Merkus and B. Metz. (1998). A Triptych sectoral approach to burden differentiation; GHG emissions in the European bubble. *Energy Policy, 26* (12), 929-943. http://www.sciencedirect.com/science/article/B6V2W-3VTY6DM-2/2/b0cd6a94b06384c447e31b765d6b570a.

Pinguelli Rosa, Luiz , Suzana Kahn Ribeiro, Maria Silvia Muylaert and Christiano Pires de Campos. (2004). Comments on the Brazilian Proposal and contributions to global temperature increase

with different climate responses - CO2 emissions due to fossil fuels, CO2 emissions due to land use change. *Energy Policy, 32* (13), 1499-1510.

Pinguelli Rosa, Luiz and Suzana Kahn Ribeiro. (2001). The present, past, and future contributions to global warming of CO_2 emissions from fuels. *Climatic Change* (48), 289-308.

Pizer, William A. (2005). The case for intensity targets. *Climate Policy, 5* (4), 455-462.

Rive, Nathan, Asbjørn Torvanger and Jan S. Fuglestvedt. (2006). Climate agreements based on responsibility for global warming: periodic updating, policy choices, and regional costs. *Global Environmental Change* (in press).

Rose, A., B. Stevens, J. Edmonds and M. Wise. (1998). International Equity and differentiation in Global Warming policy. *Environmental & Resource Economics, 12* (1), 25-51.

Schmidt, Jake, Ned Helme, Jin Lee, Mark Houdashelt and Niklas Höhne. (2006). Sector-based Approach to the Post-2012 Climate Change Policy Architecture. *Climate Policy*, (submitted).

Trudinger, C.M. and I.G. Enting. (2004). Comparison of formalisms for attributing responsibility for climate change: non-linearities in the Brazilian Proposal. *Climatic change (forthcoming)*.

UN. (2002). *World population prospects: The 2000 revision.* Data set on CD-ROM. New York: Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat.

UN. (2006). *World Population Prospects: the 2006 revision.* United Nations Department for Economic and Social Information and Policy Analysis, New York, USA.

UNFCCC. (1997). *Paper no. 1: Brazil; Proposed Elements of a Protocol to the United Nations Framework Convention on Climate Change.* No. UNFCCC/AGBM/1997/MISC.1/Add.3 GE.97. Bonn: United Nations Framework Convention on Climate Change Sekretariat.

UNFCCC. (2006). *National Communications*. United Nations Framework Convention on Climate Change. http://unfccc.int/national_reports/items/1408.php.

UNFCCC, (United Nations Framework Convention on Climate Change Secretariat). (2005). *2005 Annex I Party GHG Inventory Submissions. (1990 - 2003). Common reporting format from Finland to the UNFCCC*. http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/2761.php.

USEPA. (2002). *International analysis of methane and nitrous oxide abatement opportunities: Report to Energy Modelling Forum, Working Group 21.* Appendix A. Emissions and projections of non-CO_2 greenhouse gases for developing countries: 1990-2020. Draft. Washington, D.C., USA: United States Environmental Protection Agency.

USEPA. (2006a). *Global Anthropogenic Non-CO_2 Greenhouse Gas Emissions: 1990 – 2020.* Appendix A-D. Washington, D.C., USA: United States Environmental Protection Agency. http://www.epa.gov/nonco2/econ-inv/international.html.

USEPA. (2006b). *Global Mitigation of Non-CO_2 Greenhouse Gases.* Washington, D.C., USA: United States Environmental Protection Agency. http://www.epa.gov/nonco2/econ-inv/international.html.

USGS. (1994-2004). *Minerals Yearbook.* Reston, VA, USA: United States Geological Survey. http://minerals.er.usgs.gov/minerals/pubs/commodity/iron_&_steel/myb.

Van Aardenne, J.A., F.J. Dentener, J.G.J. Olivier, C.G.M. Klein Goldewijk and J. Lelieveld. (2001). A 1 x 1 degree resolution dataset of historical anthropogenic trace gas emissions for the period 1890-1990. *Global Biogeochemical Cycles, 15(4)*, 909-928.

World Bank. (2006). *World Bank development indicators online.* The World Bank. http://devdata.worldbank.org.

WRI. (2006). *CAIT - Climate Analysis Indicators Tool.* World Resource Institute. http://cait.wri.org/.

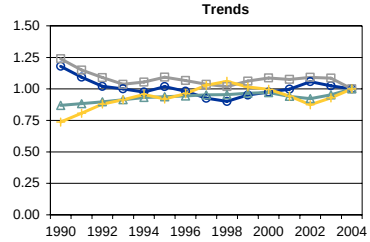
APPENDIX A FACT SHEETS

Climate fact sheet — Argentina

Economy-wide indicators

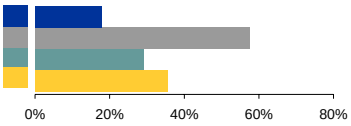
Factors driving emissions (population, GDP, energy and GHG)

Trends

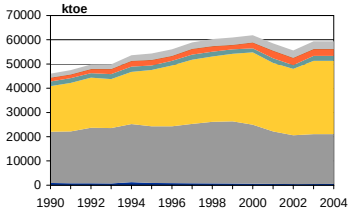


	2004		90-04	Meter
Population	38,370	ths people		
GDP (PPP)	469	bln US$ (2000)		
Prm. Energy Sply.(TPES)	59,418	ktoe		
GHG emissions	316	$MtCO_2eq.$		
GHG emissions/GDP PPP	0.674	$kgCO_2eq./US$	▼	
TPES/GDP PPP	127	toe/MUS$	▼	
GHG emissions/cap	8.2	$tCO_2eq./cap$	▲	
GDP PPP/cap	12.2	ths US$/cap	▲	
Cum. GHG 1900 to 2004	2.8	$tCO_2eq./cap/y$	▲	

Change from 1990 to 2004



Primary energy supply

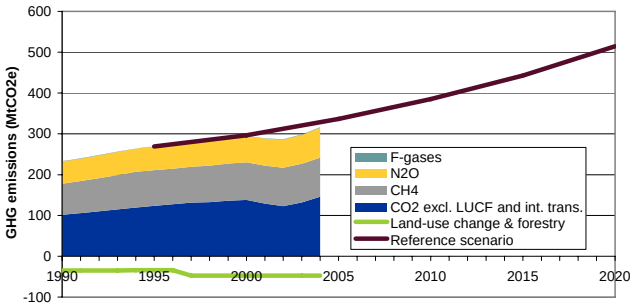


	Share in 2004
Biomass/waste	5.4%
Solar/wind/other	0.0%
Geothermal	
Hydro	4.9%
Nuclear	3.3%
Gas	51.0%
Oil	34.6%
Coal	0.9%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_20	F-gas
$0	$MtCO_2eq$					
	% gas					
	& tot.GHG					
$30	$MtCO_2eq$					
	% gas					
	& tot.GHG					

Historic and projected GHG emissions

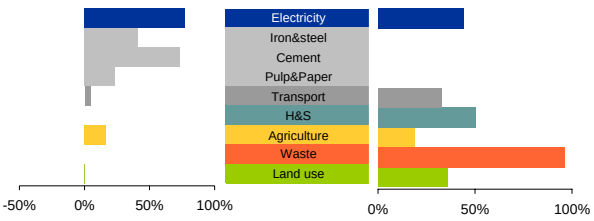


	Share in 2004
F-Gases	0%
N_2O	23%
CH_4	30%
CO_2 excluding LUCF	46%
Current CO_2 (90-04)	43.6%
Current non-CO_2 (90/95-04)	29.9%
Current total GHGs (90/95-04)	35.9%

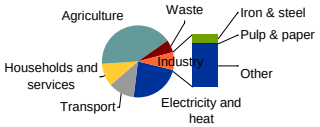
Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity	0.275	$kgCO_2$ per kWh	▼	
Share of ren. energy (RES)	10%		▲	
Incr. of RE over 1990-2004	3%			
Access to electricity	95%			
Industry				
Energy efficiency index	1.9			
Emissions per t steel	0.8	tCO_2 per t steel		
Emissions per t cement		tCO_2 per t cement		
Emissions per t pulp&paper	0.8	tCO_2 per t pulp&paper		
Transport				
Emissions per capita	0.96	$tCO_2eq.$	▲	
Household & services				
Emissions per capita	0.84	$tCO_2eq.$	▲	
Agriculture				
Emissions per capita	3.41	$tCO_2eq.$	▲	
Waste				
Emissions per capita	0.46	$tCO_2eq.$	▲	
Land use change				
Emissions per capita	-1.23	$tCO_2eq.$	▲	
International aviation and shipping				
Emissions per capita	0.05	$tCO_2eq.$	▼	

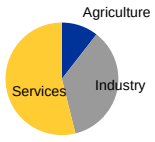
Change in production — **1990 to 2004** — **Change in emissions**



Emissions per sector 2004



GDP per sector 2004



Energy investment

Total energy research and development 2004	mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	°/₀₀	Share (per year) of total GDP	°/₀₀

Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC
National GHG targets	Voluntary reduction target of 2%-10% below projected baseline levels by 2012.
Energy related targets	
General climate policies	National Strategy for Climate Change. National Programme on Employment and sustainable Development.
Electricity	Competition has promoted gas over coal in power generation reducing emissions. High efficiency reached in electricity production. RES development.
Industry	Energy Efficiency programmes.
Transport	Promotion of public transport.
Households	Promotion of energy conservation and efficiency.
Agriculture	Several land and coastal conservation programmes. Agricultural soil and livestock management.
Waste	
CDM, JI and IET	CDM considered. Multilateral agreement with other Latin American countries.

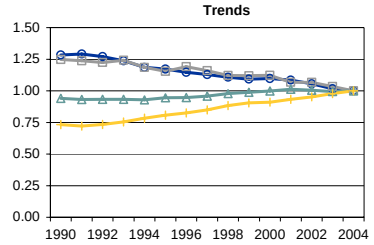
Summary

Economy: The country faced an economic crisis in 1997-9 and is still recovering from it. This was reflected in the per capita GDP which has slumped between 1998 and 2002.
Fuels: Fuel consumption has constantly increased over the years with a increase in the use of gas over oil but also an increase in biomass.
Policy: Argentina was the first developing country under the UNFCCC to establish a voluntary target.

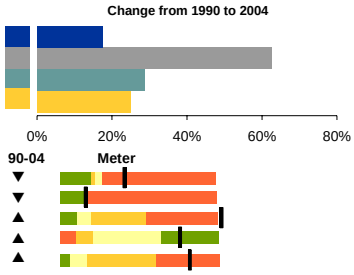
Climate fact sheet — Australia

Economy-wide indicators

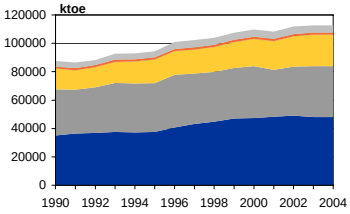
Factors driving emissions (population, GDP, energy and GHG)



	2004		90-04	Meter
Population	20,210	ths people		
GDP (PPP)	561	bln US$ (2000)		
Prm. Energy Sply.(TPES)	112,645	ktoe		
GHG emissions	529	$MtCO_2eq.$		
GHG emissions/GDP PPP	0.944	$kgCO_2eq./US$	▼	
TPES/GDP PPP	201	toe/MUS$	▼	
GHG emissions/cap	26.2	$tCO_2eq./cap$	▲	
GDP PPP/cap	27.7	ths US$/cap	▲	
Cum. GHG 1900 to 2004	10.3	$tCO_2eq./cap/y$	▲	



Primary energy supply

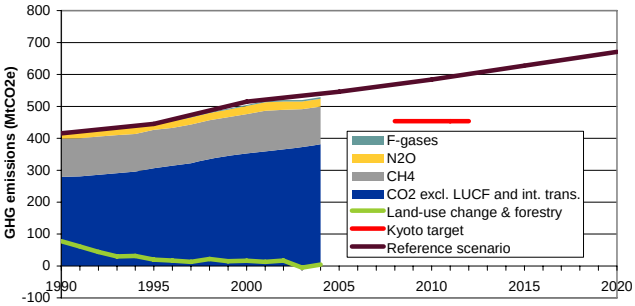


	Share in 2004
Biomass/waste	4.4%
Solar/wind/other	0.1%
Geothermal	
Hydro	1.2%
Nuclear	
Gas	19.7%
Oil	31.9%
Coal	42.6%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_20	F-gas
$0	$MtCO_2eq$					
	% gas					
	& tot.GHG					
$30	$MtCO_2eq$					
	% gas					
	& tot.GHG					

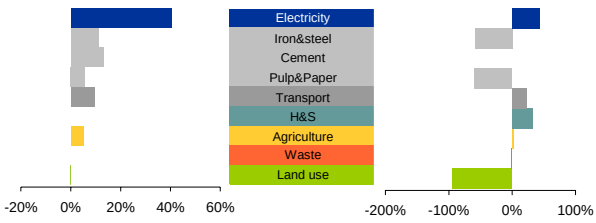
Historic and projected GHG emissions

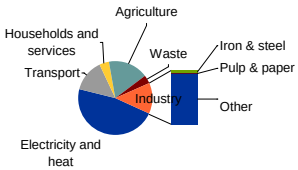


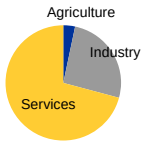
	Share in 2004
F-Gases	1%
N_2O	5%
CH_4	22%
CO_2 excluding LUCF	72%
Kyoto target (KT)	8.0%
Current CO_2 (90-04)	36.7%
Current non-CO_2 (90/95-04)	4.7%
Current total GHGs (90/95-04)	25.9%
Difference with KT	17.9%

Sectoral indicators

		2004		90-04	Meter
Electricity					
Emissions intensity	0.868	$kgCO_2$ per kWh	▲		
Share of ren. energy (RES)	6%		▼		
Incr. of RE over 1990-2004	0%				
Access to electricity	100%				
Industry					
Energy efficiency index	1.4				
Emissions per t steel	0.5	tCO_2 per t steel			
Emissions per t cement		tCO_2 per t cement			
Emissions per t pulp&paper	0.7	tCO_2 per t pulp&paper			
Transport					
Emissions per capita	3.77	$tCO_2eq.$	▲		
Household & services					
Emissions per capita	1.03	$tCO_2eq.$	▲		
Agriculture					
Emissions per capita	4.61	$tCO_2eq.$	▼		
Waste					
Emissions per capita	0.94	$tCO_2eq.$	▼		
Land use change					
Emissions per capita	0.21	$tCO_2eq.$	▼		
International aviation and shipping					
Emissions per capita	0.44	$tCO_2eq.$	▲		

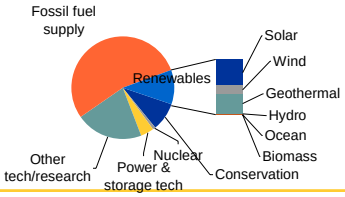






Energy investment

Total energy research and development 2004	4.9 mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	0.21 °/oo	Share (per year) of total GDP	°/oo



Policies affecting greenhouse gas emissions

Member to climate agreements or groups	UNFCCC, Annex I, Gleneagles dialogue, AP6
National GHG targets	
Energy related targets	Mandatory Renewable Energies Target of 9,500 GWh/y by 2010. Biofuels to contribute at least 350 million litres (ML) to the total fuel supply by 2010.
General climate policies	International Climate Change Policy 2004. International Climate Change Partnership. No GHG trading schemes at national level. States have made proposals for a 20 year national emissions cap and trade scheme to start in 2010.
Electricity	National minimum renewable energy target for 2010. Various fiscal incentives for renewable energy. Proposed national emissions trading scheme for large emitters from 2010.
Industry	Low emission technology abatement programme. Minimum energy performance standards for many appliances.
Transport	Biofuels capital grants programme. Tax exemption for biofuels. Voluntary commitment from the automotive industries to improve efficiency of new passenger vehicles.
Households	Energy efficiency standards for residential and commercial buildings. Minimum energy performance standards for many appliances.
Agriculture	$20.5 million allocated to the Greenhouse Action in Regional Australia (GARA) programme over 4ys.
Waste	No waste by 2010 Strategy for CH4 capture. Waste minimisation programme.
CDM, JI and IET	Not ratified Kyoto. It is intended that CDM credits would be recognised under the proposed national emissions trading scheme and a domestic offset scheme would be based on JI rules.

Summary

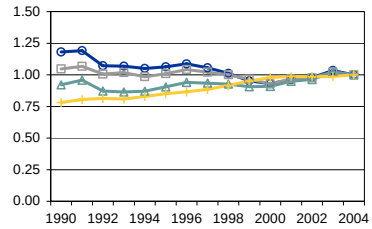
Economy: strong economy with constant increase in per capita GDP.
Emissions: one of the highest per capita emissions in the world. High emissions from transport sector.
Policy: Member of Asia-Pacific Partnership on Clean Development and Climate. Not ratified Kyoto Protocol.
National climate policy focuses on tackling climate change through the introduction of new technology, supporting negotiations and processes, and engaging developing countries to build their capacity to take action on climate change. Has bilateral climate change partnerships with USA and China.
Increasing pressure on federal government from states to take action on climate change.
Renewable energy target is low and is not stimulating investment in renewable energy.

Climate fact sheet — Austria

Economy-wide indicators

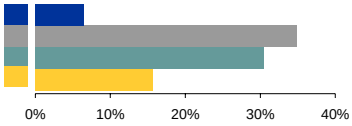
Factors driving emissions (population, GDP, energy and GHG)

Trends

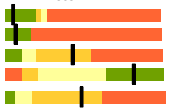


	2004		90-04	Meter
Population	8,180	ths people		
GDP (PPP)	242	bln US$ (2000)		
Prm. Energy Sply.(TPES)	32,700	ktoe		
GHG emissions	91	$MtCO_2eq.$		
GHG emissions/GDP PPP	0.377	$kgCO_2eq./US$	▼	
TPES/GDP PPP	135	toe/MUS$	▼	
GHG emissions/cap	11.2	$tCO_2eq./cap$	▲	
GDP PPP/cap	29.6	ths US$/cap	▲	
Cum. GHG 1900 to 2004	6.2	$tCO_2eq./cap/y$	▲	

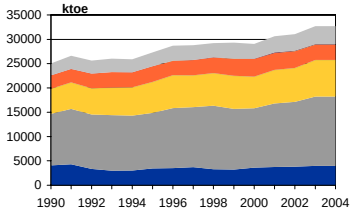
Change from 1990 to 2004



Meter



Primary energy supply

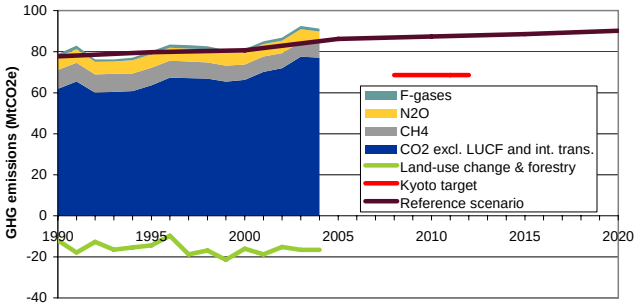


	Share in 2004
Biomass/waste	11.2%
Solar/wind/other	0.3%
Geothermal	0.1%
Hydro	9.6%
Nuclear	
Gas	23.1%
Oil	43.6%
Coal	12.1%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_20	F-gas
$0	$MtCO_2eq$					
	% gas					
	& tot.GHG					
$30	$MtCO_2eq$					
	% gas					
	& tot.GHG					

Historic and projected GHG emissions



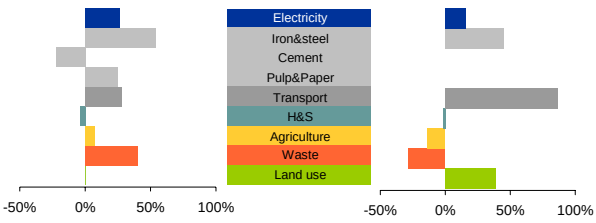
	Share in 2004
F-Gases	2%
N_2O	6%
CH_4	8%
CO_2 excluding LUCF	84%

Kyoto target (KT)	-13.0%
Current CO_2 (90-04)	24.5%
Current non-CO_2 (90/95-04)	-15.8%
Current total GHGs (90/95-04)	15.8%
Difference with KT	28.8%

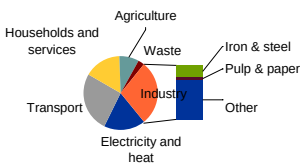
Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity	0.224	$kgCO_2$ per kWh	▼	
Share of ren. energy (RES)	21%		▲	
Incr. of RE over 1990-2004	0%			
Access to electricity	100%			
Industry				
Energy efficiency index	1.2			
Emissions per t steel	0.9	tCO_2 per t steel		
Emissions per t cement		tCO_2 per t cement		
Emissions per t pulp&paper	0.8	tCO_2 per t pulp&paper		
Transport				
Emissions per capita	2.91	$tCO_2eq.$	▲	
Household & services				
Emissions per capita	1.81	$tCO_2eq.$	▼	
Agriculture				
Emissions per capita	0.96	$tCO_2eq.$	▼	
Waste				
Emissions per capita	0.31	$tCO_2eq.$	▼	
Land use change				
Emissions per capita	-2.03	$tCO_2eq.$	▲	
International aviation and shipping				
Emissions per capita	0.19	$tCO_2eq.$	▲	

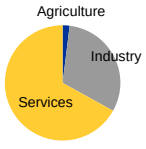
Change in production 1990 to 2004 Change in emissions



Emissions per sector 2004

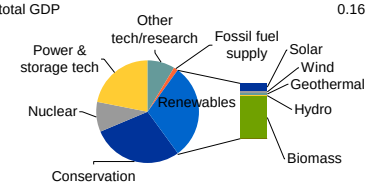


GDP per sector 2004



Energy investment

Total energy research and development 2004	4.6 mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	0.16 °/₀₀	Share (per year) of total GDP	°/₀₀



Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, Annex I
National GHG targets	
Energy related targets	4% electricity to be generated from RES (not hydro) by 2008 and a staggering 78.1% by 2010 (inc. hydro). Biofuels Directive provides indicative target of 5.75% share of biofuels in transport fuel by 2010 for each member state.
General climate policies	Austrian Climate Strategy (2008-2012). Energy Saving Agreement.
Electricity	EU ETS. Feed-in tariffs for RE. Tax on electricity consumption, taxes on fuels for heat production, ecological tax reform under discussion. Tax rebates for efficient CHPs. Trading scheme for 'small hydro certificates' in operation since 2001.
Industry	EU ETS. IPPC Directive of the EC; partial phase-out of HFCs and SF6. Extensive energy efficiency programme. Voluntary agreements.
Transport	95% tax exemption for biofuels. CO2 labelling of passenger cars. Investments in rail and urban transport. Promotion of combined transport.
Households	Housing support schemes. Support for renewables in buildings. Replacement of old heating systems and support for insulation.
Agriculture	Common Agricultural Policy of the EC; Programme for Environmentally Compatible Agriculture. €25 mln/y allocated to energy from biomass
Waste	Landfill Directive of the EC; Waste Management Act (1990); Landfill Regulation (1996). CH4 capture and combustion for district heating.
CDM, JI and IET	Austria's CDM/JI programme intends to purchase approximately 3-5 MtCO2 worth of CDM/JI credits annually. Austria are excluding CDM/JI credits from LULUCF in the EU ETS.

Summary

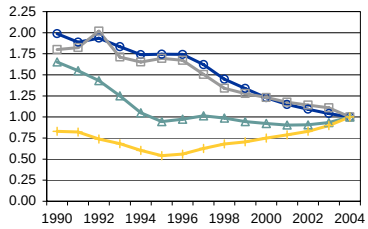
Economy: stable government with growing economy.
Fuels: major increase in the share of oil in primary energy supply. High emissions in the household sector which is addressed in the national policy.
Policy: Unlikely to meet Kyoto targets with domestic measures. Ambitious renewable energy plan to generate over 3/4 of the country's gross electricity consumption from RES (especially hydro).
Special emphasis on energy efficiency measures in the buildings and transport sector.

Climate fact sheet — Belarus

Economy-wide indicators

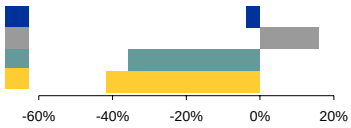
Factors driving emissions (population, GDP, energy and GHG)

Trends

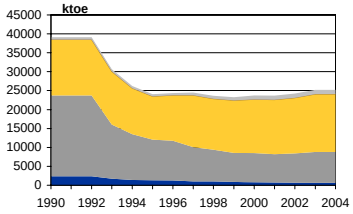


	2004		90-04	Meter
Population	9,820	ths people		
GDP (PPP)	63	bln US$ (2000)		
Prm. Energy Sply.(TPES)	25,209	ktoe		
GHG emissions	74	$MtCO_2eq.$		
GHG emissions/GDP PPP	1.182	$kgCO_2eq./US$	▼	
TPES/GDP PPP	401	toe/MUS$	▼	
GHG emissions/cap	7.6	$tCO_2eq./cap$	▼	
GDP PPP/cap	6.4	ths US$/cap	▲	
Cum. GHG 1900 to 2004	4.5	$tCO_2eq./cap/y$	▲	

Change from 1990 to 2004



Primary energy supply

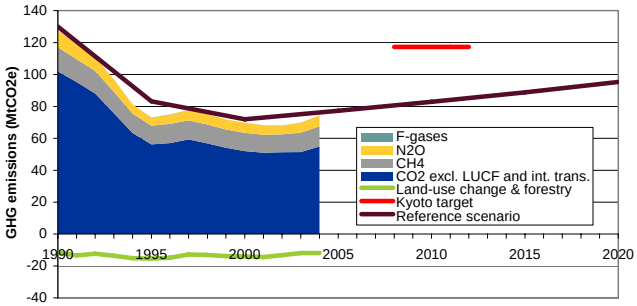


	Share in 2004
Biomass/waste	4.3%
Solar/wind/other	
Geothermal	
Hydro	0.0%
Nuclear	
Gas	60.7%
Oil	32.4%
Coal	2.5%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_20	F-gas
$0	$MtCO_2eq$					
	% gas					
	& tot.GHG					
$30	$MtCO_2eq$					
	% gas					
	& tot.GHG					

Historic and projected GHG emissions

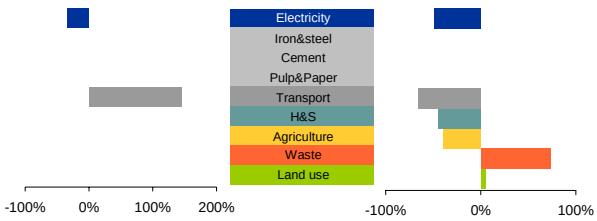


	Share in 2004
F-Gases	0%
N_2O	9%
CH_4	17%
CO_2 excluding LUCF	74%
Kyoto target (KT)	-8.0%
Current CO_2 (90-04)	-46.1%
Current non-CO_2 (90/95-04)	-23.6%
Current total GHGs (90/95-04)	-41.6%
Difference with KT	-33.6%

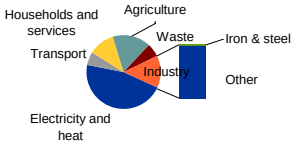
Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity	0.294	$kgCO_2$ per kWh		
Share of ren. energy (RES)	4%		▲	
Incr. of RE over 1990-2004	3%			
Access to electricity				
Industry				
Emissions per t steel	0.1	tCO_2 per t steel		
Emissions per t cement		tCO_2 per t cement		
Emissions per t pulp&paper	1.5	tCO_2 per t pulp&paper		
Transport				
Emissions per capita	0.45	$tCO_2eq.$	▼	
Household & services				
Emissions per capita	0.86	$tCO_2eq.$	▼	
Agriculture				
Emissions per capita	1.25	$tCO_2eq.$	▼	
Waste				
Emissions per capita	0.45	$tCO_2eq.$	▲	
Land use change				
Emissions per capita	-1.21	$tCO_2eq.$	▲	
International aviation and shipping				
Emissions per capita	0.03	$tCO_2eq.$	▲	

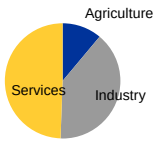
Change in production — **1990 to 2004** — **Change in emissions**



Emissions per sector 2004



GDP per sector 2004



Energy investment

Total energy research and development 2004	mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	°/₀₀	Share (per year) of total GDP	°/₀₀

Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, Annex I
National GHG targets	Kyoto target is -8% with the requirement not not sell additional 7%
Energy related targets	
General climate policies	Draft National Climate Programme (1999). Law on environmental Protection (2002); National action plan on rational use of natural resources and environmental protection for 2001–2005 (2001)National strategy of sustainable development of the Republic of Belarus (1997)
Electricity	Decree 1820 “Additional measures for economic and efficient use of fuel and energy resources” (2002). Energy conservation programme for 2001-2005. Main directions of energy policy for 2001-2005 and for the period until 2015 (2000).
Industry	Concern Belneftekhim programme for technology innovation and environmental protection.
Transport	Concept of social and economic development of the transportation complex of the Republic of Belarus until 2015; Concept of reducing the negative impact of transport on the environment.
Households	
Agriculture	Programme for increased energy efficiency in agribusiness over 2000–2005.
Waste	Waste management programme in place.
CDM, JI and IET	ET and JI under consideration if ratification of the Kyoto Protocol takes place. No established reduction target for Belarus complicates discussions. Pilot JI project with Germany is under consideration.

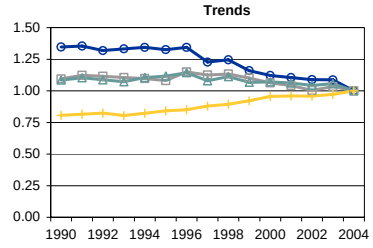
Summary

Economy: Unstable economy with volatile per capita GDP in the mid 1990s, however, growing ever since.
Emissions: Major decrease of per capita emissions in the last decade due to economic crisis.
Fuels: major increase in the share of oil in the primary energy supply over the last decade. Some disagreements over the pricing of gas supplies from Russia has limited the expansion of gas use in the country.
Policy: Reduction target of Annex B of Kyoto Protocol is yet to be decided. Limited polices on climate change and renewable energies. Some intervention on energy efficiency. Intends to use JI/CDM projects.

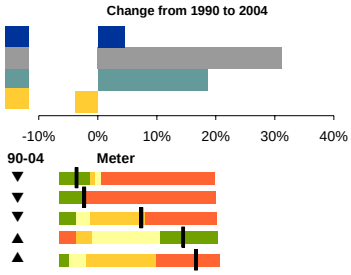
Climate fact sheet — Belgium

Economy-wide indicators

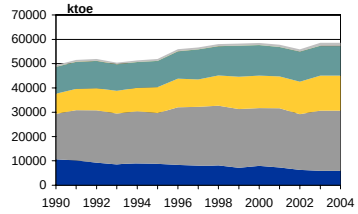
Factors driving emissions (population, GDP, energy and GHG)



	2004		90-04	Meter
Population	10,420	ths people		
GDP (PPP)	298	bln US$ (2000)		
Prm. Energy Sply.(TPES)	58,606	ktoe		
GHG emissions	140	$MtCO_2eq.$		
GHG emissions/GDP PPP	0.471	$kgCO_2eq./US$	▼	
TPES/GDP PPP	197	toe/MUS$	▼	
GHG emissions/cap	13.5	$tCO_2eq./cap$	▼	
GDP PPP/cap	28.6	ths US$/cap	▲	
Cum. GHG 1900 to 2004	10.9	$tCO_2eq./cap/y$	▲	



Primary energy supply

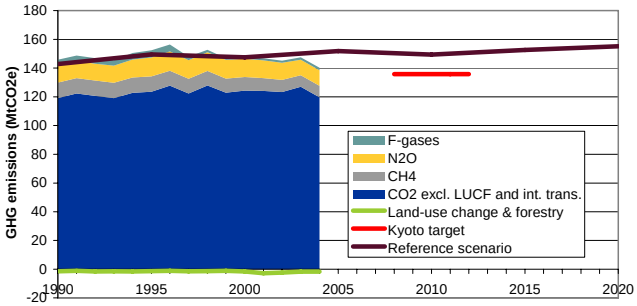


	Share in 2004
Biomass/waste	2.0%
Solar/wind/other	0.0%
Geothermal	0.0%
Hydro	0.0%
Nuclear	21.1%
Gas	24.6%
Oil	42.2%
Coal	10.1%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_20	F-gas
$0	$MtCO_2eq$					
	% gas					
	& tot.GHG					
$30	$MtCO_2eq$	10	10			
	% gas	8%	8%			
	& tot.GHG	6%	6%			

Historic and projected GHG emissions

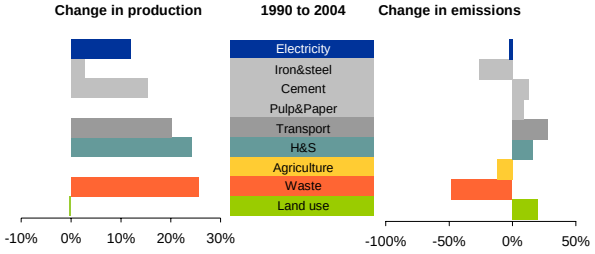


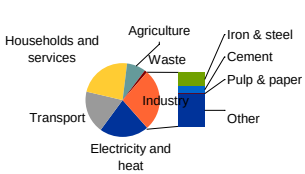
	Share in 2004
F-Gases	1%
N_2O	8%
CH_4	6%
CO_2 excluding LUCF	85%

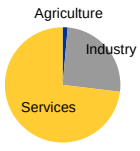
Kyoto target (KT)	-7.5%
Current CO_2 (90-04)	0.4%
Current non-CO_2 (90/95-04)	-25.5%
Current total GHGs (90/95-04)	-4.5%
Difference with KT	3.0%

Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity	0.274	$kgCO_2$ per kWh	▼	
Share of ren. energy (RES)	2%		▲	
Incr. of RE over 1990-2004	1%			
Access to electricity	100%			
Industry				
Energy efficiency index	1.5			
Emissions per t steel	0.8	tCO_2 per t steel		
Emissions per t cement	0.6	tCO_2 per t cement		
Emissions per t pulp&paper	1.1	tCO_2 per t pulp&paper		
Transport				
Emissions per capita	2.51	$tCO_2eq.$	▲	
Household & services				
Emissions per capita	3.15	$tCO_2eq.$	▲	
Agriculture				
Emissions per capita	1.10	$tCO_2eq.$	▼	
Waste				
Emissions per capita	0.17	$tCO_2eq.$	▼	
Land use change				
Emissions per capita	-0.16	$tCO_2eq.$	▲	
International aviation and shipping				
Emissions per capita	2.69	$tCO_2eq.$	▲	

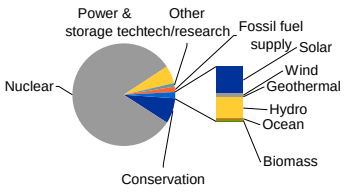






Energy investment

Total energy research and development 2004	3.4 mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	0.21 °/₀₀	Share (per year) of total GDP	°/₀₀



Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, Annex I
National GHG targets	
Energy related targets	Flanders: 25% energy generated from CHP plants by 2010 and 6% from RES. Wallonia: 20% energy generated from CHP plants by 2010 and 8% from RES. Soltherm programme: 200,000 m2 of PV by 2010. Renewable Electricity Directive provides a target of 6% of electricity consumption from renewable sources by 2010 Biofuels Directive provides indicative target of 5.75% share of biofuels in transport fuel by 2010 for each member state
General climate policies	National Climate Plan 2002-2012. Climate Policy Plan (Flanders, 2003); Plan for Climate Change (Wallonia, 2001). Support to energy-related R&D and emission reduction studies. Creation and operation of the Kyoto Fund (2003).
Electricity	EU ETS, regional administration. Obligation and green certificate system to stimulate renewable electricity, run regionally.
Industry	EU ETS, regional administration. Benchmarking covenants on energy efficiency introduced in 2002.
Transport	Tax exemption for biofuels. Subsidies for freight transport by rail. Tax reductions for low emission cars.
Households	Tax deductions for improving building insulation and efficiency. Incentives for the rational use of energy (RUS) and RES. Soltherm programme: 200,000 m2 of PV by 2010.
Agriculture	Common Agricultural Policy of the EC. Rural Development Programme (Flanders & Wallonia). Regional plans to support agrienvironmental practices and organic farming.
Waste	Regional regulations and procedures for waste management; waste charges; ban on landfilling organic waste. Introduction and development of landfill gas recovery.
CDM, JI and IET	€25 mln/y allocated by the Kyoto Fund to develop CDM/JI projects. Multilateral agreements with African and Asian countries on land management have contributed indirectly to GHG reductions.

Summary

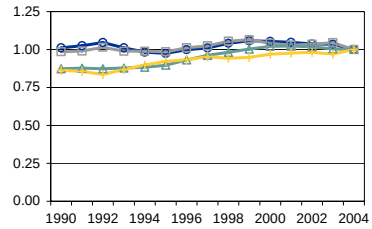
Emissions: low per capita emission rate compared to other European countries.
Fuels: development of the gas network has encouraged a greater use of gas especially in the last 5 ys.
Policy: Many policies administered regionally which leads to complexity in climate policy.
Innovative green certificate trading scheme for renewable electricity but complicated system because of regional level implementation.

Climate fact sheet — Brazil

Economy-wide indicators

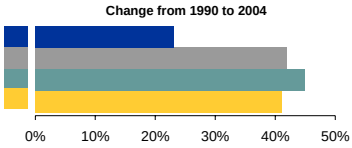
Factors driving emissions (population, GDP, energy and GHG)

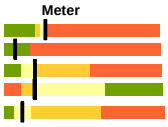
Trends



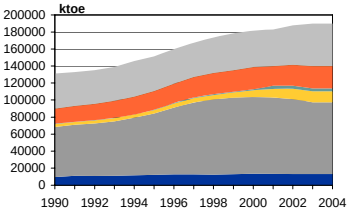
	2004		90-04	Meter
Population	183,910	ths people		
GDP (PPP)	1,385	bln US$ (2000)		
Prm. Energy Sply.(TPES)	190,050	ktoe		
GHG emissions	983	$MtCO_2eq.$		
GHG emissions/GDP PPP	0.710	$kgCO_2eq./US$	▼	
TPES/GDP PPP	137	toe/MUS$	▲	
GHG emissions/cap	5.3	$tCO_2eq./cap$	▲	
GDP PPP/cap	7.5	ths US$/cap	▲	
Cum. GHG 1900 to 2004	1.6	$tCO_2eq./cap/y$	▲	

Change from 1990 to 2004





Primary energy supply

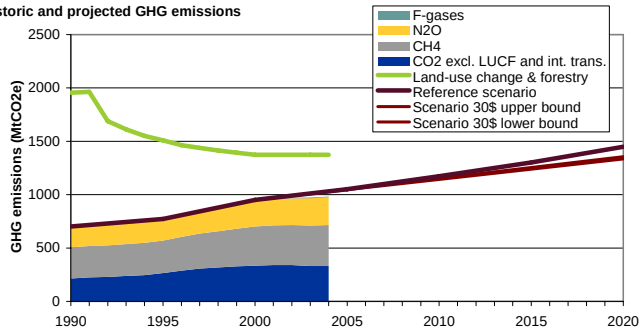


	Share in 2004
Biomass/waste	26.3%
Solar/wind/other	0.0%
Geothermal	
Hydro	13.8%
Nuclear	1.8%
Gas	6.7%
Oil	44.4%
Coal	6.9%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_20	F-gas
$0	$MtCO_2eq$			15	1	3
	% gas			3%	0%	14%
	& tot.GHG			1%	0%	0%
$30	$MtCO_2eq$	45	65	30	10	8
	% gas	7%	11%	7%	3%	41%
	& tot.GHG	3%	5%	2%	1%	1%

Historic and projected GHG emissions

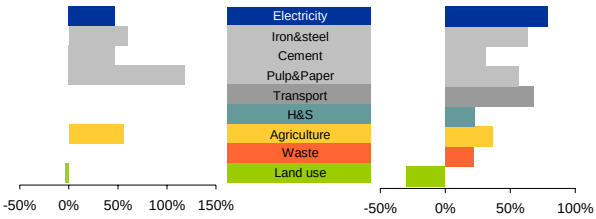


	Share in 2004
F-Gases	1%
N_2O	26%
CH_4	39%
CO_2 excluding LUCF	34%
Current CO_2 (90-04)	53.8%
Current non-CO_2 (90/95-04)	34.8%
Current total GHGs (90/95-04)	40.7%

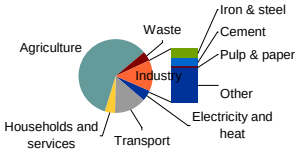
Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity	0.078	$kgCO_2$ per kWh	▲	
Share of ren. energy (RES)	40%		▼	
Incr. of RE over 1990-2004	-5%			
Access to electricity	95%			
Industry				
Energy efficiency index	1.6			
Emissions per t steel	0.7	tCO_2 per t steel		
Emissions per t cement	0.6	tCO_2 per t cement		
Emissions per t pulp&paper	0.4	tCO_2 per t pulp&paper		
Transport				
Emissions per capita	0.74	$tCO_2eq.$	▲	
Household & services				
Emissions per capita	0.23	$tCO_2eq.$	▼	
Agriculture				
Emissions per capita	3.16	$tCO_2eq.$	▲	
Waste				
Emissions per capita	0.23	$tCO_2eq.$	▼	
Land use change				
Emissions per capita	7.47	$tCO_2eq.$	▼	
International aviation and shipping				
Emissions per capita	0.07	$tCO_2eq.$	▲	

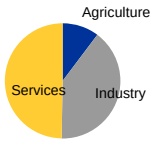
Change in production 1990 to 2004 Change in emissions



Emissions per sector 2004



GDP per sector 2004



Energy investment

Total energy research and development 2004	mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	°/₀₀	Share (per year) of total GDP	°/₀₀

Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, Gleneagles dialogue, G77 & China
National GHG targets	
Energy related targets	Reduction of 130 TWh in electricity consumption by 2015 (PROCEL). 23 per cent mix of ethanol to be added to all petroleum supplies in the country (no date available)
General climate policies	Green VAT in some states, Environmental Crimes Law (1998), Brazilian Agenda 21, National Programme for the Rational Use of Fuel (CONPET).
Electricity	National Electrical Energy Conservation Programme (PROCEL), Programme for Incentive of Alternative Electric Energy Sources (PROFINA).
Industry	Affected indirectly by strategies for energy saving and fuel switch.
Transport	National Alcohol Programme (Proalcool) to support the use of ethanol as substitute for petrol, National Programme for the Production and Use of Biodiesel (Probiodiesel).
Households	Green Protocol on environmental responsibilities of banks, Programme on energy saving in public illumination (RELUZ).
Agriculture	Several programmes exist to monitor and decrease deforestation of the rainforests.
Waste	Climate Change Research Programme to monitor GHG emissions and mitigation strategies focusing on biogas from waste treatment.
CDM, JI and IET	Very important host country for CDM projects (58 registered), good developed CDM infrastructure, several government resolutions on CDM procedures.

Summary

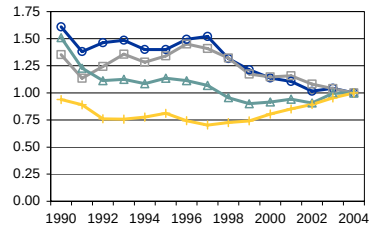
Emissions: Increasing national emissions caused by rising number of population and production and per capita energy consumption. High emission rates per GDP, low emission rates per capita. Emissions from deforestation and agriculture account for at least half of the national greenhouse gas emissions. Very low emission intensity for electricity generation due to extensive use of hydropower.
Fuels: One of the highest consumers of biomass in the world. Renewables account for over 40% of primary energy supply. World leader in the use of biofuels in transport
Policy: Already in the late 1970s Brazil started to develop policies with emission reducing side effects. Today, many efforts to increase energy efficiency as well as use of renewables and natural gas. Many CDM activities, good CDM infrastructure.

Climate fact sheet — Bulgaria

Economy-wide indicators

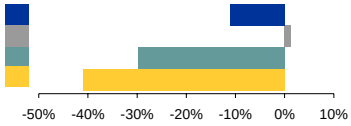
Factors driving emissions (population, GDP, energy and GHG)

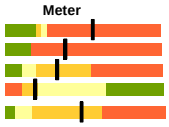
Trends



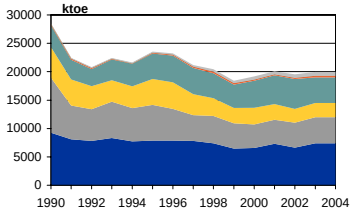
	2004		90-04	Meter
Population	7,760	ths people		
GDP (PPP)	58	bln US$ (2000)		
Prm. Energy Sply.(TPES)	19,982	ktoe		
GHG emissions	68	$MtCO_2eq.$		
GHG emissions/GDP PPP	1.172	$kgCO_2eq./US$	▼	
TPES/GDP PPP	347	toe/MUS$	▼	
GHG emissions/cap	8.7	$tCO_2eq./cap$	▼	
GDP PPP/cap	7.4	ths US$/cap	▲	
Cum. GHG 1900 to 2004	6.2	$tCO_2eq./cap/y$	▲	

Change from 1990 to 2004





Primary energy supply

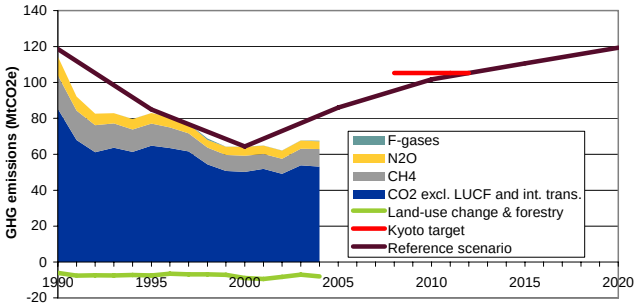


	Share in 2004
Biomass/waste	3.5%
Solar/wind/other	
Geothermal	
Hydro	1.3%
Nuclear	22.6%
Gas	12.5%
Oil	23.0%
Coal	37.0%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_20	F-gas
$0	$MtCO_2eq$					
	% gas					
	& tot.GHG					
$30	$MtCO_2eq$					
	% gas					
	& tot.GHG					

Historic and projected GHG emissions

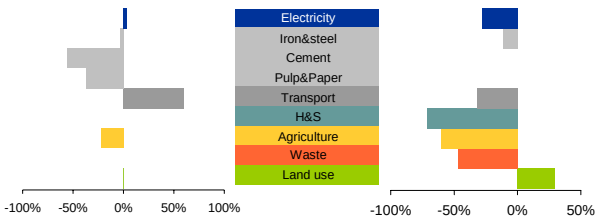


	Share in 2004
F-Gases	0%
N_2O	7%
CH_4	14%
CO_2 excluding LUCF	79%
Kyoto target (KT)	-8.0%
Current CO_2 (90-04)	-37.7%
Current non-CO_2 (90/95-04)	-50.6%
Current total GHGs (90/95-04)	-41.0%
Difference with KT	-33.0%

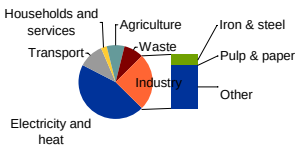
Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity	0.472	$kgCO_2$ per kWh	▲	
Share of ren. energy (RES)	5%		▲	
Incr. of RE over 1990-2004	4%			
Access to electricity	100%			
Industry				
Energy efficiency index	2.5			
Emissions per t steel	1.6	tCO_2 per t steel		
Emissions per t cement		tCO_2 per t cement		
Emissions per t pulp&paper		tCO_2 per t pulp&paper		
Transport				
Emissions per capita	0.96	$tCO_2eq.$	▼	
Household & services				
Emissions per capita	0.24	$tCO_2eq.$	▼	
Agriculture				
Emissions per capita	0.66	$tCO_2eq.$	▼	
Waste				
Emissions per capita	0.76	$tCO_2eq.$	▼	
Land use change				
Emissions per capita	-1.03	$tCO_2eq.$	▲	
International aviation and shipping				
Emissions per capita	0.10	$tCO_2eq.$	▲	

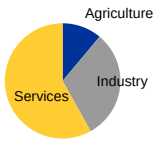
Change in production 1990 to 2004 Change in emissions



Emissions per sector 2004



GDP per sector 2004



Energy investment

Total energy research and development 2004	mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	°/₀₀	Share (per year) of total GDP	°/₀₀

Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, Annex I
National GHG targets	
Energy related targets	Renewable Electricity Directive provides a target of 11% of electricity consumption from renewable sources by 2010 5.75% of biofuels in transport fuel by 2008
General climate policies	National Climate Change Action Plan (2000). Energy Strategy for the Environment.
Electricity	EU ETS from 2007. Energy Law (2002). National Energy Efficiency Programme on Renewables. Loss reduction programme. State energy efficiency fund. New nuclear plant. Incentives for CHP plants.
Industry	EU ETS from 2007. IPPC directive. New Centre for Energy Efficiency in Industry (CEEI). Mandatory energy audits.
Transport	Motor-fuel tax. Development of infrastructure: €4 bn allocated.
Households	Energy efficiency awareness campaigns. District heating programme.
Agriculture	National Agriculture and Rural Development Plan for 2000–2006. Sustainable agriculture and farming programme. New Agro-statistical unit.
Waste	Nation Waste Management Plan (NWMP). Waste minimisation programme and recycling. Construction of new landfills.
CDM, JI and IET	Interest shown. Memorandums of understanding on JI signed with Austria, the Netherlands and Switzerland. JI capacity-building project with UNDP.

Summary

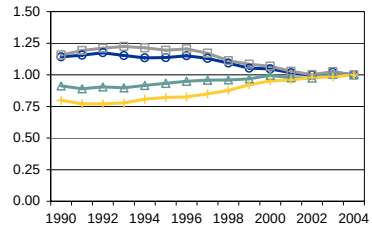
Emissions: decreasing emissions in the last decade.
Fuels: coal accounts for almost half of the primary energy supply.
Policy: will be part of the EU ETS in 2007. Major focus on energy efficiency and infrastructure development. Promotion of nuclear power.

Climate fact sheet — Canada

Economy-wide indicators

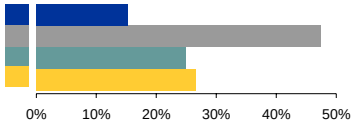
Factors driving emissions (population, GDP, energy and GHG)

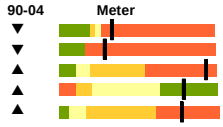
Trends



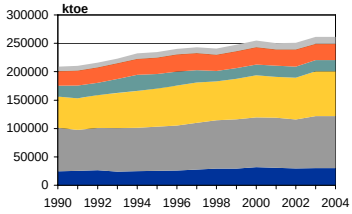
	2004		90-04	Meter
Population	31,950	ths people		
GDP (PPP)	919	bln US$ (2000)		
Prm. Energy Sply.(TPES)	261,216	ktoe		
GHG emissions	758	$MtCO_2eq.$		
GHG emissions/GDP PPP	0.825	$kgCO_2eq./US$	▼	
TPES/GDP PPP	284	toe/MUS$	▼	
GHG emissions/cap	23.7	$tCO_2eq./cap$	▲	
GDP PPP/cap	28.8	ths US$/cap	▲	
Cum. GHG 1900 to 2004	9.8	$tCO_2eq./cap/y$	▲	

Change from 1990 to 2004





Primary energy supply

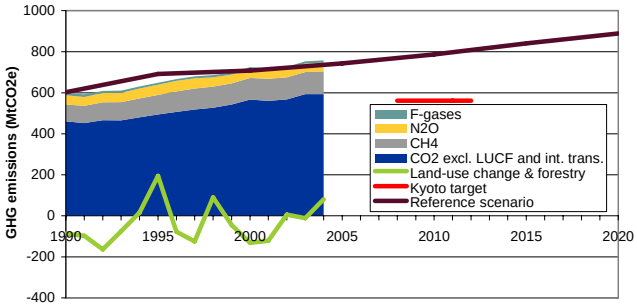


	Share in 2004
Biomass/waste	4.5%
Solar/wind/other	0.0%
Geothermal	
Hydro	11.1%
Nuclear	7.5%
Gas	30.3%
Oil	35.1%
Coal	11.5%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_2O	F-gas
$0	$MtCO_2eq$			5	0	2
	% gas			4%	0%	9%
	& tot.GHG			1%	0%	0%
$30	$MtCO_2eq$			24	2	9
	% gas			20%	2%	36%
	& tot.GHG			3%	0%	1%

Historic and projected GHG emissions

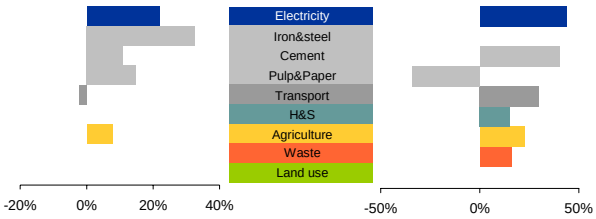


	Share in 2004
F-Gases	1%
N_2O	6%
CH_4	15%
CO_2 excluding LUCF	78%
Kyoto target (KT)	-6.0%
Current CO_2 (90-04)	28.8%
Current non-CO_2 (90/95-04)	20.6%
Current total GHGs (90/95-04)	27.0%
Difference with KT	33.0%

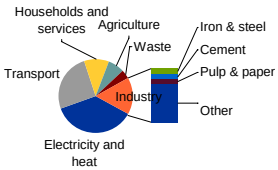
Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity	0.224	$kgCO_2$ per kWh	▲	
Share of ren. energy (RES)	16%		▼	
Incr. of RE over 1990-2004	0%			
Access to electricity	100%			
Industry				
Energy efficiency index	1.7			
Emissions per t steel	0.8	tCO_2 per t steel		
Emissions per t cement	0.9	tCO_2 per t cement		
Emissions per t pulp&paper	0.3	tCO_2 per t pulp&paper		
Transport				
Emissions per capita	6.05	$tCO_2eq.$	▲	
Household & services				
Emissions per capita	2.60	$tCO_2eq.$	▼	
Agriculture				
Emissions per capita	1.72	$tCO_2eq.$	▲	
Waste				
Emissions per capita	0.90	$tCO_2eq.$	▲	
Land use change				
Emissions per capita	2.53	$tCO_2eq.$	▼	
International aviation and shipping				
Emissions per capita	0.37	$tCO_2eq.$	▲	

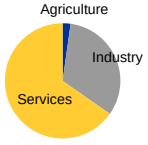
Change in production — **1990 to 2004** — **Change in emissions**



Emissions per sector 2004

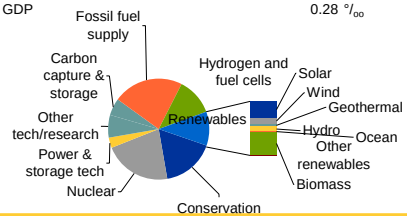


GDP per sector 2004



Energy investment

Total energy research and development 2004	44.3 mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	0.28 °/₀₀	Share (per year) of total GDP	°/₀₀



Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, Annex I, Gleneagles dialogue
National GHG targets	
Energy related targets	
General climate policies	Climate Change Plan, planned emissions trading scheme for large emitters.
Electricity	Large Final Emitters (LFE) trading scheme planned. Incentives for renewables (wind, ethanol) in order to achieve a target of 10% of new capacity to come from renewable sources. However in 2006 the Canadian government indicated a suspension of funding for new Wind Power Production Incentive projects. Province of Ontario committed to phasing out coal-fired electricity by 2009.
Industry	Large Final Emitters (LFE) trading scheme planned. Several schemes for cooperation & technology transfer with international partners.
Transport	Tax exemption for biofuels. Hydrogen on buses scheme. Commercial Transportation Energy Efficiency and Fuels Initiative. Voluntary targets for automotive sector.
Households	Eco labels for efficient electrical appliances. Grants for solar thermal and other eco-friendly heating systems.
Agriculture	Afforestation and forest management schemes. Several schemes for soil management and GHG reduction.
Waste	Energy recovery from landfill gases. Many recycling schemes of residential waste at local level.
CDM, JI and IET	New Climate Fund to purchase domestic reductions/removals and international emission allowances from CDM, JI and IET.

Summary

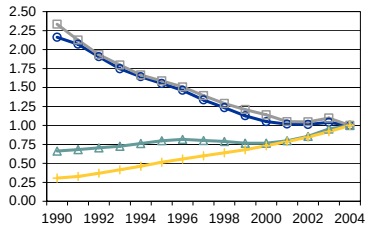
Emissions: High emission levels compared to average of industrialised countries, particularly in the transport and household sectors. Strongly increasing emissions, far from Kyoto target. Highly volatile emissions from the forestry sector.
Policy: Supportive of the Kyoto Protocol and starting to implement national measures. Various funding programmes available. Many state level policies and measures.

Climate fact sheet — China

Economy-wide indicators

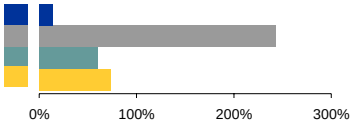
Factors driving emissions (population, GDP, energy and GHG)

Trends

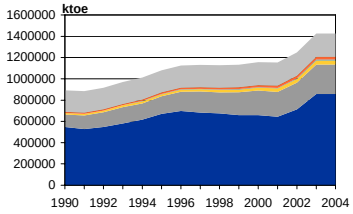


	2004		90-04	Meter
Population	1,303,040	ths people		
GDP (PPP)	7,219	bln US$ (2000)		
Prm. Energy Sply.(TPES)	1,425,890	ktoe		
GHG emissions	6,467	$MtCO_2eq.$		
GHG emissions/GDP PPP	0.896	$kgCO_2eq./US$	▼	
TPES/GDP PPP	198	toe/MUS$	▼	
GHG emissions/cap	5.0	$tCO_2eq./cap$	▲	
GDP PPP/cap	5.5	ths US$/cap	▲	
Cum. GHG 1900 to 2004	1.2	$tCO_2eq./cap/y$	▲	

Change from 1990 to 2004



Primary energy supply

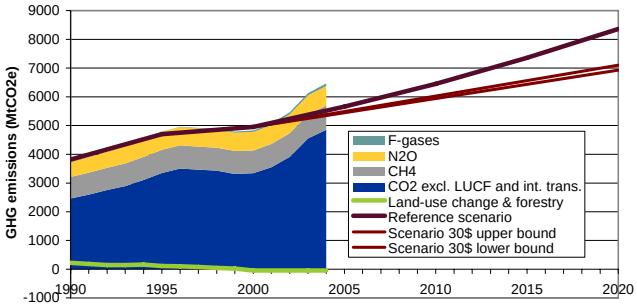


	Share in 2004
Biomass/waste	15.4%
Solar/wind/other	
Geothermal	
Hydro	1.7%
Nuclear	0.8%
Gas	2.5%
Oil	19.5%
Coal	60.1%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_2O	F-gas
$0	$MtCO_2eq$			56	6	46
	% gas			5%	1%	20%
	& tot.GHG			1%	0%	1%
$30	$MtCO_2eq$	770	940	294	41	159
	% gas	12%	15%	28%	5%	69%
	& tot.GHG	9%	11%	4%	0%	2%

Historic and projected GHG emissions



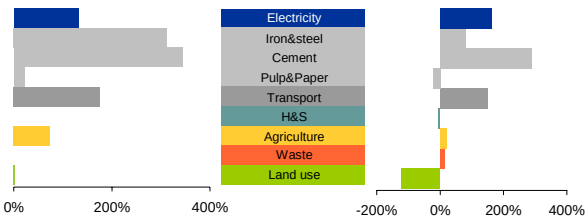
	Share in 2004
F-Gases	1%
N_2O	10%
CH_4	13%
CO_2 excluding LUCF	75%

Current CO_2 (90-04)	97.4%
Current non-CO_2 (90/95-04)	25.5%
Current total GHGs (90/95-04)	72.7%

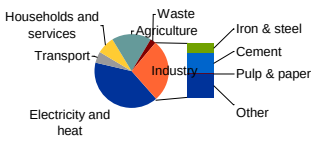
Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity	0.771	$kgCO_2$ per kWh	▲	
Share of ren. energy (RES)	17%		▼	
Incr. of RE over 1990-2004	-7%			
Access to electricity	99%			
Industry				
Energy efficiency index	1.9			
Emissions per t steel	1.2	tCO_2 per t steel		
Emissions per t cement	0.7	tCO_2 per t cement		
Emissions per t pulp&paper	1.5	tCO_2 per t pulp&paper		
Transport				
Emissions per capita	0.24	$tCO_2eq.$	▲	
Household & services				
Emissions per capita	0.40	$tCO_2eq.$	▼	
Agriculture				
Emissions per capita	0.84	$tCO_2eq.$	▲	
Waste				
Emissions per capita	0.13	$tCO_2eq.$	▼	
Land use change				
Emissions per capita	-0.04	$tCO_2eq.$	▼	
International aviation and shipping				
Emissions per capita	0.05	$tCO_2eq.$	▲	

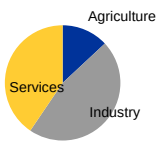
Change in production 1990 to 2004 Change in emissions



Emissions per sector 2004

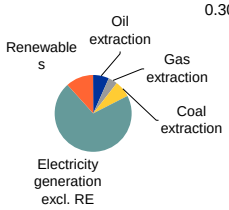


GDP per sector 2004



Energy investment

Total energy research and development 2004	mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	5790 mln US$ (2000)
Share of total GDP	°/₀₀	Share (per year) of total GDP	0.30 °/₀₀



Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, Gleneagles dialogue, AP6, G77 & China
National GHG targets	
Energy related targets	Energy intensity target: -20% primary energy per GDP from 2005 to 2010. Target of 15% renewable energy supply in total energy by 2020.
General climate policies	Several policies on finance, credit and taxation to support energy conservation. Law on Energy conservation, development of China Energy Label.
Electricity	Projects and policies to improve the infrastructure for natural gas transmission. Renewable Energy Law including a feed in tariff, a national fund, discounted lending and tax preferences.
Industry	Energy conservation Voluntary Agreement (Pilot Project 1996). Law on Coal, Law on Mine Resources also including conservation and environmental protection.
Transport	Improvement of public transport in many big cities; standards to limit energy consumption of cars
Households	Guidelines and standards for energy conservation in public buildings; Promotion of city heating supply system reform.
Agriculture	
Waste	
CDM, JI and IET	Very important host country for CDM projects (18 registered), good developed CDM infrastructure.

Summary

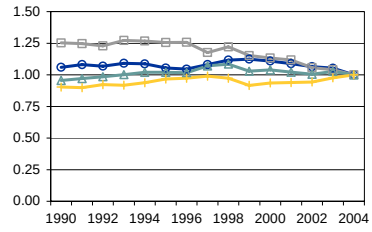
Economy: one of the fastest growing economies in the world with an average annual GDP growth of over 8% in last decade.
Investment data: China has invested $578 bn in energy projects, of which $68bn where invested in renewable energy.
Emissions: Increasing total emissions due to population growth and increasing per capita consumption. Low emissions per capita, decreasing but still high emissions per GDP. High emission intensity for electricity generation due to a strong dependence on coal. Trend towards less energy intensive industry and decreasing emission intensity.
Fuels: High but decreasing share of residential biomass use. Coal accounts for about 2/3 of the country's primary energy supply. Sharp increase in fuel demand in the last 5 years.
Policy: The fast development of the energy system includes efforts to increase renewable sources and implement energy efficiency measures. Since the 1980s China paid significant attention to environmental issues which had a positive influence on emissions. Many CDM activities, good CDM infrastructure. Energy intensity target of -20% between 2005 and 2010.

Climate fact sheet — Colombia

Economy-wide indicators

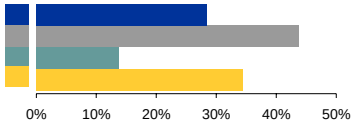
Factors driving emissions (population, GDP, energy and GHG)

Trends

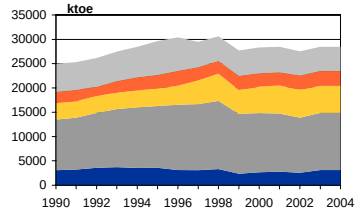


	2004		90-04	Meter
Population	44,920	ths people		
GDP (PPP)	300	bln US$ (2000)		
Prm. Energy Sply.(TPES)	28,467	ktoe		
GHG emissions	160	$MtCO_2eq.$		
GHG emissions/GDP PPP	0.535	$kgCO_2eq./US$	▼	
TPES/GDP PPP	95	toe/MUS$	▼	
GHG emissions/cap	3.6	$tCO_2eq./cap$	▲	
GDP PPP/cap	6.7	ths US$/cap	▲	
Cum. GHG 1900 to 2004	1.1	$tCO_2eq./cap/y$	▲	

Change from 1990 to 2004



Primary energy supply

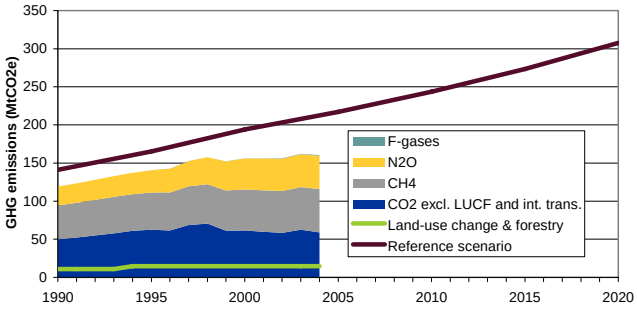


	Share in 2004
Biomass/waste	17.3%
Solar/wind/other	
Geothermal	
Hydro	10.9%
Nuclear	
Gas	19.5%
Oil	41.4%
Coal	10.9%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_20	F-gas
$0	$MtCO_2eq$					
	% gas					
	& tot.GHG					
$30	$MtCO_2eq$					
	% gas					
	& tot.GHG					

Historic and projected GHG emissions

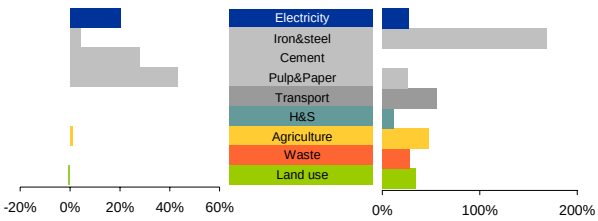


	Share in 2004
F-Gases	0%
N_2O	27%
CH_4	35%
CO_2 excluding LUCF	37%
Current CO_2 (90-04)	18.9%
Current non-CO_2 (90/95-04)	45.5%
Current total GHGs (90/95-04)	34.4%

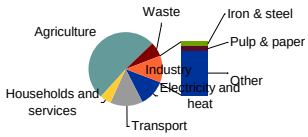
Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity	0.153	$kgCO_2$ per kWh	▼	
Share of ren. energy (RES)	28%		▼	
Incr. of RE over 1990-2004	-4%			
Access to electricity	81%			
Industry				
Energy efficiency index	1.5			
Emissions per t steel	2.4	tCO_2 per t steel		
Emissions per t cement		tCO_2 per t cement		
Emissions per t pulp&paper	3.7	tCO_2 per t pulp&paper		
Transport				
Emissions per capita	0.51	$tCO_2eq.$	▲	
Household & services				
Emissions per capita	0.18	$tCO_2eq.$	▼	
Agriculture				
Emissions per capita	1.83	$tCO_2eq.$	▲	
Waste				
Emissions per capita	0.22	$tCO_2eq.$	▼	
Land use change				
Emissions per capita	0.33	$tCO_2eq.$	▲	
International aviation and shipping				
Emissions per capita	0.02	$tCO_2eq.$	▲	

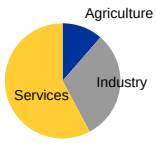
Change in production — **1990 to 2004** — **Change in emissions**



Emissions per sector 2004



GDP per sector 2004



Energy investment

Total energy research and development 2004	mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	°/₀₀	Share (per year) of total GDP	°/₀₀

Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, G77 & China
National GHG targets	
Energy related targets	No targets in place.
General climate policies	National Energy Plan (1994) plus policies to encourage efficient use of energy sources.
Electricity	Increase the availability of generation plant and increase the competition in the energy sector.
Industry	National "Cleaner Production" policy (1997)
Transport	Gas conversion programmes, emission controls, restrictions on the use of vehicles and investment in mass urban public transport systems.
Households	No particular policy
Agriculture	Agricultural sector moving increasingly towards ecological farming practices. Policies in place to restore and establish forest for carbon sequestration.
Waste	Integrated Waste Disposal Management Policy (1997)
CDM, JI and IET	National Strategic Study for Climate Change (1999) prepared strategy for Colombia's participation in CDM with support from Swiss Gov and World Bank.

Summary

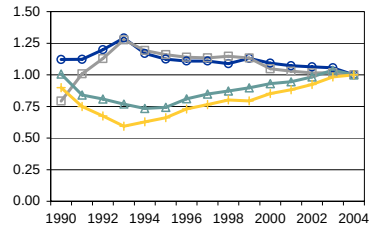
Economy: increased per capita GDP in the last decade.
Emissions: low per capita GHG emissions but substantial increase in emission from the waste sector.
Fuels: very large share of biomass compared to other industrialised countries although this has been reduced in the last 10 years.
Policy: GHG mitigation policies in place since 1994, although primary reason for introduction not always climate change mitigation. Interested in participating to CDM projects.

Climate fact sheet — Croatia

Economy-wide indicators

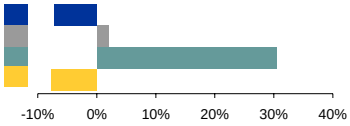
Factors driving emissions (population, GDP, energy and GHG)

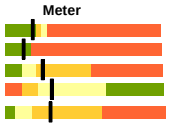
Trends



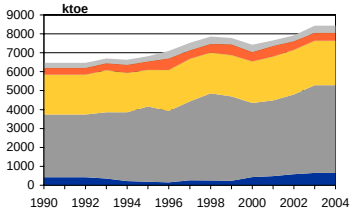
	2004		90-04	Meter
Population	4,440	ths people		
GDP (PPP)	50	bln US$ (2000)		
Prm. Energy Sply.(TPES)	8,445	ktoe		
GHG emissions	29	$MtCO_2eq.$		
GHG emissions/GDP PPP	0.574	$kgCO_2eq./US$	▼	
TPES/GDP PPP	170	toe/MUS$	▲	
GHG emissions/cap	6.4	$tCO_2eq./cap$	▼	
GDP PPP/cap	11.2	ths US$/cap	▲	
Cum. GHG 1900 to 2004	3.7	$tCO_2eq./cap/y$	▲	

Change from 1990 to 2004





Primary energy supply

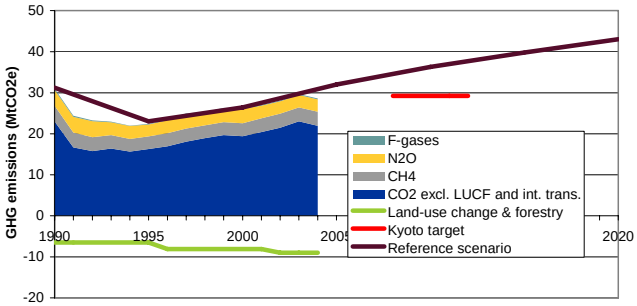


	Share in 2004
Biomass/waste	4.5%
Solar/wind/other	
Geothermal	
Hydro	5.0%
Nuclear	
Gas	27.9%
Oil	54.9%
Coal	7.7%

Emission reduction potential until 2020 below reference scenario

	CO_2 upper	CO_2 lower	CH_4	N_20	F-gas
$0	$MtCO_2eq$				
	% gas				
	& tot.GHG				
$30	$MtCO_2eq$				
	% gas				
	& tot.GHG				

Historic and projected GHG emissions



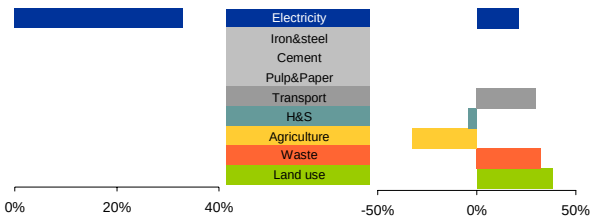
	Share in 2004
F-Gases	1%
N_2O	10%
CH_4	12%
CO_2 excluding LUCF	77%

Kyoto target (KT)	-5.0%
Current CO_2 (90-04)	-4.5%
Current non-CO_2 (90/95-04)	-15.0%
Current total GHGs (90/95-04)	-7.1%
Difference with KT	-2.1%

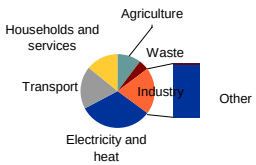
Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity	0.379	$kgCO_2$ per kWh		
Share of ren. energy (RES)	9%		▼	
Incr. of RE over 1990-2004	0%			
Access to electricity	100%			
Industry				
Emissions per t steel	0.7	tCO_2 per t steel		
Emissions per t cement		tCO_2 per t cement		
Emissions per t pulp&paper	1.1	tCO_2 per t pulp&paper		
Transport				
Emissions per capita	1.19	$tCO_2eq.$	▲	
Household & services				
Emissions per capita	0.92	$tCO_2eq.$	▲	
Agriculture				
Emissions per capita	0.66	$tCO_2eq.$	▼	
Waste				
Emissions per capita	0.28	$tCO_2eq.$	▲	
Land use change				
Emissions per capita	-2.03	$tCO_2eq.$	▲	
International aviation and shipping				
Emissions per capita	0.04	$tCO_2eq.$	▲	

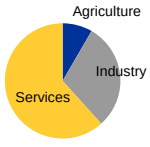
Change in production — **1990 to 2004** — **Change in emissions**



Emissions per sector 2004



GDP per sector 2004



Energy investment

Total energy research and development 2004	mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	°/₀₀	Share (per year) of total GDP	°/₀₀

Policies affecting greenhouse gas emissions

Member to climate agreements or groups	UNFCCC, Annex I
National GHG targets	
Energy related targets	No specific targets
General climate policies	Strategy and Action Plan for Mitigation of Climate Changes in the Republic of Croatia (end of 2006), Strategic Framework of Development 2006-2013.
Electricity	The Energy Development Strategy of the Republic of Croatia (2002) aims at improving energy efficiency and promotes renewables. Reform of energy sector in 2001.
Industry	Energy efficiency project funded by the IBRD for public lighting, building construction, industry and energy supply systems. Target of -5% emissions from cement industry by 2008-12 from 2006 levels.
Transport	The Transport Development Strategy of Croatia (1999). Tax on passengers cars. Target of 5.75% for biofuels by 2010.
Households	Ordinance on Energy Efficiency Labelling of Household Appliances (2005). Energy efficiency promotion project jointly financed by the Global Environmental Facility and domestic institutions (2005-2010)
Agriculture	Agriculture Act (2001) aims to reduce N2O emissions by using mineral and organic fertilisers. Measures in place to increase carbon uptake from soils. The Forestry Act (2005) aims to increase stock and improve carbon uptake.
Waste	Waste Act (2005). Measures in place to reduce waste and incentives to recycle beverage containers. Tax on packaging disposal and on tyres.
CDM, JI and IET	Environmental Protection and Energy Efficiency Fund (2003) to promote JI/CDM projects. Active in capacity building.

Summary

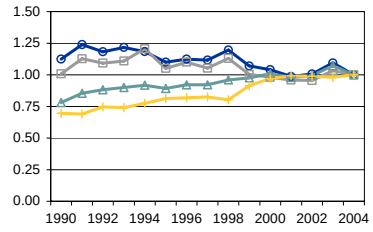
Economy: since the war in the early nineties the country is recovering well.
Emissions: emissions sharply decreased compared to previous years during the war but have increased consistently ever since. The Kyoto target for 2012 is very close and could be exceeded.
Fuels: oil use has filled the demand gap but gas consumption remains stable.
Policy: Main focus on environment rather than climate change with energy efficiency high in the agenda. JI considered and active in capacity building.

Climate fact sheet — Cyprus

Economy-wide indicators

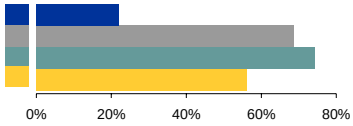
Factors driving emissions (population, GDP, energy and GHG)

Trends

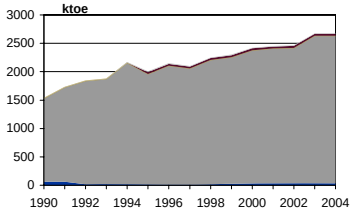


	2004		90-04	Meter
Population	830	ths people		
GDP (PPP)	17	bln US$ (2000)		
Prm. Energy Sply.(TPES)	2,677	ktoe		
GHG emissions	8	$MtCO_2eq.$		
GHG emissions/GDP PPP	0.475	$kgCO_2eq./US\$$	▼	
TPES/GDP PPP	155	toe/MUS$	▼	
GHG emissions/cap	9.9	$tCO_2eq./cap$	▲	
GDP PPP/cap	20.9	ths US$/cap	▲	
Cum. GHG 1900 to 2004	2.4	$tCO_2eq./cap/y$	▲	

Change from 1990 to 2004



Primary energy supply

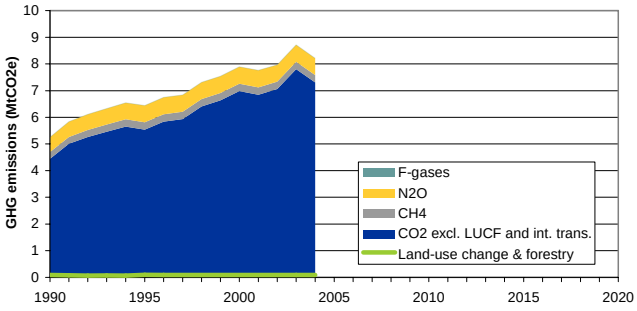


	Share in 2004
Biomass/waste	0.3%
Solar/wind/other	1.3%
Geothermal	
Hydro	
Nuclear	
Gas	
Oil	97.0%
Coal	1.3%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_20	F-gas
$0	$MtCO_2eq$					
	% gas					
	& tot.GHG					
$30	$MtCO_2eq$					
	% gas					
	& tot.GHG					

Historic and projected GHG emissions



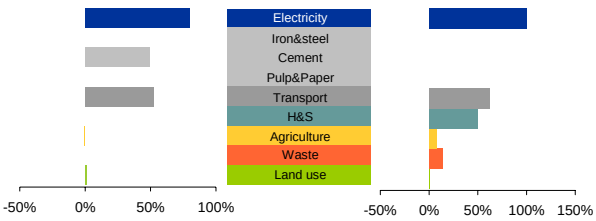
	Share in 2004
F-Gases	0%
N_2O	8%
CH_4	3%
CO_2 excluding LUCF	89%

Current CO_2 (90-04)	64.5%
Current non-CO_2 (90/95-04)	11.5%
Current total GHGs (90/95-04)	56.3%

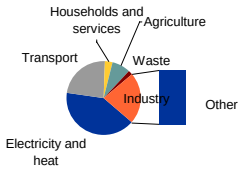
Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity	0.834	$kgCO_2$ per kWh	▼	
Share of ren. energy (RES)	2%		▲	
Incr. of RE over 1990-2004	1%			
Access to electricity	100%			
Industry				
Emissions per t steel		tCO_2 per t steel		
Emissions per t cement		tCO_2 per t cement		
Emissions per t pulp&paper		tCO_2 per t pulp&paper		
Transport				
Emissions per capita	2.31	$tCO_2eq.$	▲	
Household & services				
Emissions per capita	0.33	$tCO_2eq.$	▲	
Agriculture				
Emissions per capita	0.79	$tCO_2eq.$	▼	
Waste				
Emissions per capita	0.19	$tCO_2eq.$	▼	
Land use change				
Emissions per capita	0.11	$tCO_2eq.$	▼	
International aviation and shipping				
Emissions per capita	1.70	$tCO_2eq.$	▲	

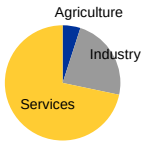
Change in production — **1990 to 2004** — **Change in emissions**



Emissions per sector 2004



GDP per sector 2004



Energy investment

Total energy research and development 2004	mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	°/₀₀	Share (per year) of total GDP	°/₀₀

Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, G77 & China, AOSIS
National GHG targets	No Kyoto target
Energy related targets	Renewable Electricity Directive provides a target of 6% of electricity consumption from renewable sources by 2010 Biofuels Directive provides indicative target of 5.75% share of biofuels in transport fuel by 2010 for each member state
General climate policies	The Council of Ministers has recently approved the framework of a Strategic Plan for the reduction of the rate of increase of GHG emissions.
Electricity	Switch to gas.
Industry	Green products procurement.
Transport	-
Households	-
Agriculture	Organic farming policy and land management programmes in place.
Waste	Law on the Management of Solid and Hazardous Waste (2002). Measures in place to prevent and reduce packaging waste.
CDM, JI and IET	First 2 CDM projects registered in Europe with the Mary and Alexigros wind farms in December 2006.

Summary

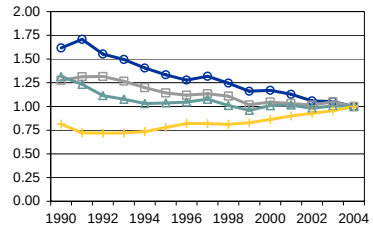
Economy: healthy and growing economy.
Emissions: mainly from electricity production and transport. Emissions have doubled since 1990.
Fuels: Heavily dependent on oil but is planning to switch to gas in the near future.
Policy: No coordinated climate change policy but no target under the Kyoto protocol.

Climate fact sheet — Czech Republic

Economy-wide indicators

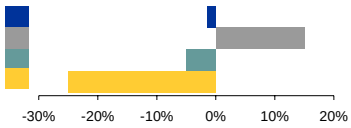
Factors driving emissions (population, GDP, energy and GHG)

Trends

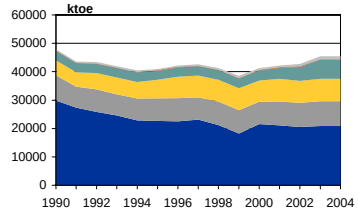


	2004		90-04	Meter
Population	10,210	ths people		
GDP (PPP)	182	bln US$ (2000)		
Prm. Energy Sply.(TPES)	45,512	ktoe		
GHG emissions	147	$MtCO_2eq.$		
GHG emissions/GDP PPP	0.807	$kgCO_2eq./US$	▼	
TPES/GDP PPP	250	toe/MUS$	▼	
GHG emissions/cap	14.4	$tCO_2eq./cap$	▼	
GDP PPP/cap	17.8	ths US$/cap	▲	
Cum. GHG 1900 to 2004	11.0	$tCO_2eq./cap/y$	▲	

Change from 1990 to 2004



Primary energy supply

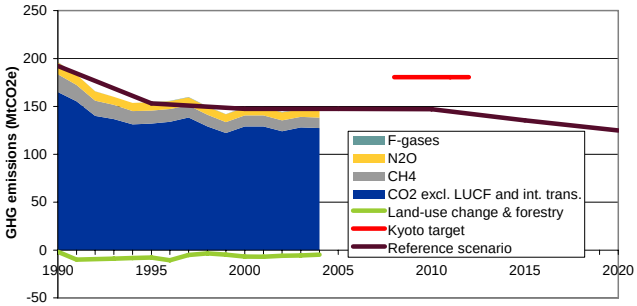


	Share in 2004
Biomass/waste	2.6%
Solar/wind/other	0.0%
Geothermal	
Hydro	0.3%
Nuclear	14.8%
Gas	17.2%
Oil	19.3%
Coal	45.9%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_20	F-gas
$0	$MtCO_2eq$					
	% gas					
	& tot.GHG					
$30	$MtCO_2eq$	7	7			
	% gas	7%	7%			
	& tot.GHG	6%	6%			

Historic and projected GHG emissions



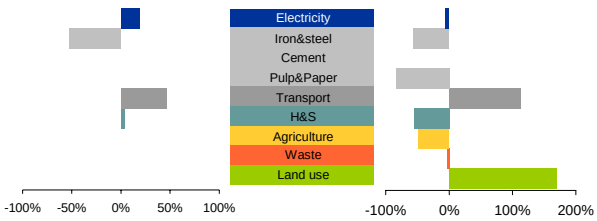
	Share in 2004
F-Gases	0%
N_2O	6%
CH_4	7%
CO_2 excluding LUCF	87%

Kyoto target (KT)	-8.0%
Current CO_2 (90-04)	-22.9%
Current non-CO_2 (90/95-04)	-36.5%
Current total GHGs (90/95-04)	-25.1%
Difference with KT	-17.1%

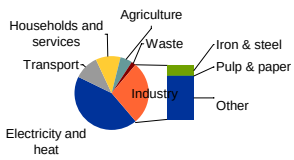
Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity	0.502	$kgCO_2$ per kWh	▼	
Share of ren. energy (RES)	3%		▲	
Incr. of RE over 1990-2004	2%			
Access to electricity	100%			
Industry				
Energy efficiency index	1.9			
Emissions per t steel	1.1	tCO_2 per t steel		
Emissions per t cement		tCO_2 per t cement		
Emissions per t pulp&paper	0.6	tCO_2 per t pulp&paper		
Transport				
Emissions per capita	1.56	$tCO_2eq.$	▲	
Household & services				
Emissions per capita	1.55	$tCO_2eq.$	▼	
Agriculture				
Emissions per capita	0.79	$tCO_2eq.$	▼	
Waste				
Emissions per capita	0.28	$tCO_2eq.$	▼	
Land use change				
Emissions per capita	-0.47	$tCO_2eq.$	▲	
International aviation and shipping				
Emissions per capita	0.08	$tCO_2eq.$	▼	

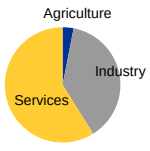
Change in production — **1990 to 2004** — **Change in emissions**



Emissions per sector 2004

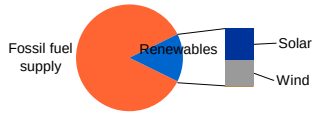


GDP per sector 2004



Energy investment

Total energy research and development 2004	mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	0.04 °/₀₀	Share (per year) of total GDP	°/₀₀



Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, Annex I
National GHG targets	Long-term targets of -25% GHG by 2020 from 2000 levels and -30% per capita CO2 from 2000 levels.
Energy related targets	State Energy Policy (2004) with renewable electricity target of 8% in 2010 and 17% in 2030 Renewable Electricity Directive provides a target of 8% of electricity consumption from renewable sources by 2010
General climate policies	National Program to Mitigate the Impacts of Climate Change. Prototype Carbon Fund Purchase Agreement between the Czech Republic and the World Bank (2002). Participates to EU ETS
Electricity	EU ETS. Ambitious State Energy Policy (2004) with renewable electricity target of 8% in 2010 and 17% in 2030. Feed-in system for electricity from renewables. CHP has been in place since 2002.
Industry	EU ETS. Promotion of energy efficiency.
Transport	Support for renewal of public transport vehicles. Government has set minimum volumes of biofuel to be delivered 2007-2012.
Households	Financial support for residential building insulation and repairs.
Agriculture	Land use planning.
Waste	Act on Waste (2002); Act on Waste Management (2002); collection and use of biogas at landfill sites
CDM, JI and IET	Actively participated in JI projects only in the position of a host country, no foreseeable participation as a state in the next future.

Summary

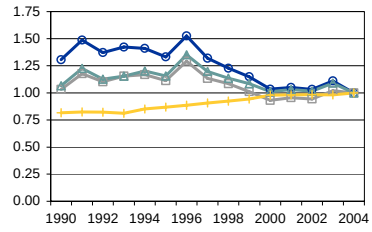
Economy: economic crisis in 1999 affected the primary energy supply and emissions with a sharp decrease compared to previous years. However, the country has largely recovered since then.
Emissions: GHG emissions have fallen substantially but remain comparatively high due to the large consumption of coal. Nonetheless, the country is expected to easily meet its commitment under the Kyoto Protocol. Comparatively high per capita emissions in the household sector.
Fuels: decreasing use of coal with an increase in nuclear energy in the last 5 years.
Policy: There is potential for improving energy efficiency. Gas and electricity market deregulation could take longer that expected. Main focus of environmental policy in the energy field has been on air pollution. Actively participates in JI projects as a host country.

Climate fact sheet — Denmark

Economy-wide indicators

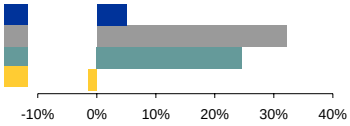
Factors driving emissions (population, GDP, energy and GHG)

Trends



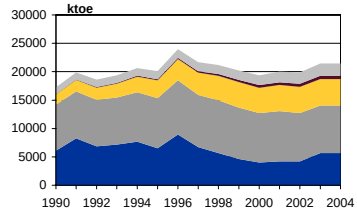
	2004	
Population	5,400	ths people
GDP (PPP)	159	bln US$ (2000)
Prm. Energy Sply.(TPES)	21,486	ktoe
GHG emissions	68	$MtCO_2eq.$
GHG emissions/GDP PPP	0.430	$kgCO_2eq./US$
TPES/GDP PPP	136	toe/MUS$
GHG emissions/cap	12.6	$tCO_2eq./cap$
GDP PPP/cap	29.4	ths US$/cap
Cum. GHG 1900 to 2004	8.3	$tCO_2eq./cap/y$

Change from 1990 to 2004



90-04	Meter
▼	
▼	
▼	
▲	
▲	

Primary energy supply

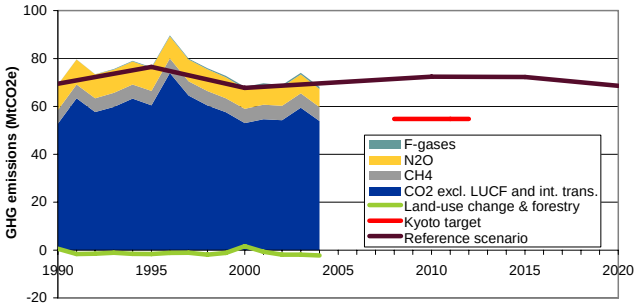


	Share in 2004
Biomass/waste	10.3%
Solar/wind/other	2.6%
Geothermal	0.0%
Hydro	0.0%
Nuclear	
Gas	21.7%
Oil	39.0%
Coal	26.4%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_20	F-gas
$0	$MtCO_2eq$					
	% gas					
	& tot.GHG					
$30	$MtCO_2eq$	7	7			
	% gas	12%	12%			
	& tot.GHG	10%	10%			

Historic and projected GHG emissions



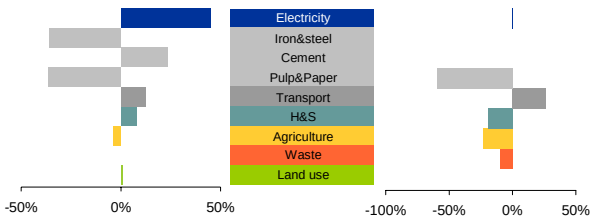
	Share in 2004
F-Gases	1%
N_2O	11%
CH_4	8%
CO_2 excluding LUCF	79%

Kyoto target (KT)	-21.0%
Current CO_2 (90-04)	2.3%
Current non-CO_2 (90/95-04)	-14.8%
Current total GHGs (90/95-04)	-1.8%
Difference with KT	19.2%

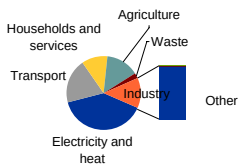
Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity	0.356	$kgCO_2$ per kWh	▼	
Share of ren. energy (RES)	13%		▲	
Incr. of RE over 1990-2004	6%			
Access to electricity	100%			
Industry				
Energy efficiency index	2.3			
Emissions per t steel	0.3	tCO_2 per t steel		
Emissions per t cement		tCO_2 per t cement		
Emissions per t pulp&paper	2.3	tCO_2 per t pulp&paper		
Transport				
Emissions per capita	2.47	$tCO_2eq.$	▲	
Household & services				
Emissions per capita	1.42	$tCO_2eq.$	▼	
Agriculture				
Emissions per capita	1.85	$tCO_2eq.$	▼	
Waste				
Emissions per capita	0.26	$tCO_2eq.$	▼	
Land use change				
Emissions per capita	-0.42	$tCO_2eq.$	▼	
International aviation and shipping				
Emissions per capita	0.94	$tCO_2eq.$	▲	

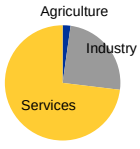
Change in production 1990 to 2004 Change in emissions



Emissions per sector 2004



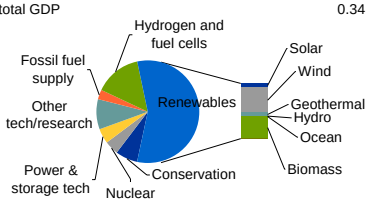
GDP per sector 2004



Energy investment

Total energy research and development 2004 3.5 mln US$ (2005)
Share of total GDP 0.34 °/oo

Energy infrastructure investments 2001 to 2010 mln US$ (2000)
Share (per year) of total GDP °/oo



Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, Annex I
National GHG targets	Climate Change Strategy 2003 - Aims to meet 50% of Kyoto target through EU ETS. For the remainder abatement cost threshold of €16/tCO2 set. Below this Denmark will take domestic action, below this will participate in CDM/JI or buy credits
Energy related targets	Renewable Electricity Directive provides a target of 29% of electricity consumption from renewable sources by 2010 Proposed target of renewables to provide up to 30% of total energy consumption by 2025 Biofuels Directive provides indicative target of 5.75% share of biofuels in transport fuel by 2010 for each member state
General climate policies	Climate Change Strategy 2003 - Aims to meet 50% of Kyoto target through EU ETS. For the remainder abatement cost threshold of €16/tCO2 set. Below this Denmark will take domestic action, below this will participate in CDM/JI or buy credits. Energy Saving Action Plan 2005. Energy taxation consists of excise tax, CO2 tax and SO2 tax.
Electricity	EU ETS. Energy Strategy 2025. Premium on top of wholesale electricity price to support onshore wind power, tendering rounds to promote offshore wind power and fixed feed-in tariffs for electricity from other renewable technologies. Taxes on gas, oil and coal.
Industry	IPPC Directive of the EC. Tax on F-gases. Voluntary agreements on energy efficiency under the "green tax package"
Transport	Biofuels exempt from CO2 tax. Energy labelling of new cars and reduced purchase tax on energy efficient new cars.
Households	Act on Promotion of Savings in Energy Consumption. Energy labelling of buildings and appliances.
Agriculture	Action Plans for the Aquatic Environment I and II and Action Plan for Sustainable Agriculture. NPO Action Plan on pollution from livestock manure.
Waste	Waste Strategy 2005-08; Landfill Directive. Aims to reduce waste amounts sent to landfill to 9% in 2008 and increasing recycling to 65% of all waste.
CDM, JI and IET	€58m Denmark Carbon Fund for CDM/JI projects and credits. In NAP I the Government expressed its intention to buy ~3.7MtCO2/yr worth of credits. Very early Danish JI pilot programme in 1999.

Summary

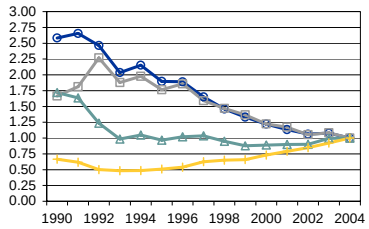
Economy: high tax rate system in place.
Emissions: comparatively high per capita GHG emissions in the transport and household sector.
Fuels: History of strong renewables support. World leader in terms of percentage of wind power. Taxes on high carbon fuels. Higher fuel consumption in 1993 and 1996 due to exceptionally cold winters.
Policy: Promotion of offshore wind power. Bilateral environmental assistance to Central and Eastern European countries.

Climate fact sheet — Estonia

Economy-wide indicators

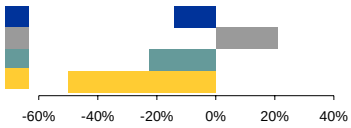
Factors driving emissions (population, GDP, energy and GHG)

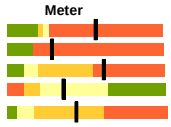
Trends



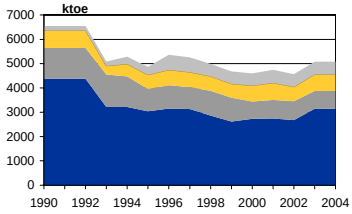
	2004		90-04	Meter
Population	1,350	ths people		
GDP (PPP)	18	bln US$ (2000)		
Prm. Energy Sply.(TPES)	5,078	ktoe		
GHG emissions	21	$MtCO_2eq.$		
GHG emissions/GDP PPP	1.182	$kgCO_2eq./US$	▼	
TPES/GDP PPP	281	toe/MUS$	▼	
GHG emissions/cap	15.8	$tCO_2eq./cap$	▼	
GDP PPP/cap	13.4	ths US$/cap	▲	
Cum. GHG 1900 to 2004	5.6	$tCO_2eq./cap/y$	▲	

Change from 1990 to 2004





Primary energy supply

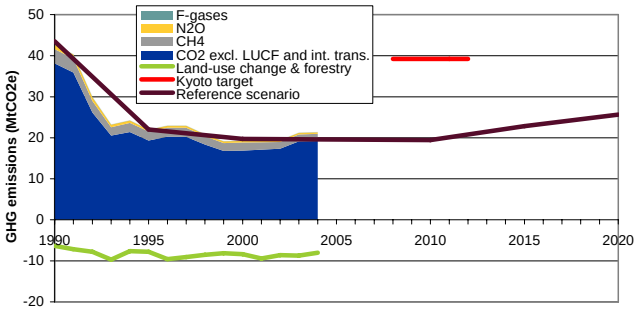


	Share in 2004
Biomass/waste	10.2%
Solar/wind/other	0.0%
Geothermal	
Hydro	0.0%
Nuclear	
Gas	13.4%
Oil	14.4%
Coal	61.9%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_2O	F-gas
$0	$MtCO_2eq$					
	% gas					
	& tot.GHG					
$30	$MtCO_2eq$					
	% gas					
	& tot.GHG					

Historic and projected GHG emissions



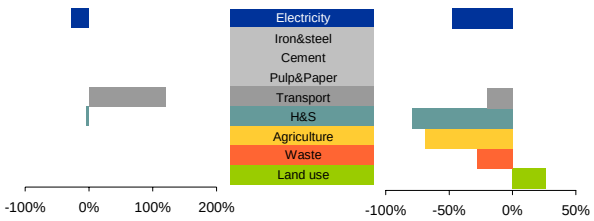
	Share in 2004
F-Gases	0%
N_2O	2%
CH_4	8%
CO_2 excluding LUCF	90%

Kyoto target (KT)	-8.0%
Current CO_2 (90-04)	-49.5%
Current non-CO_2 (90/95-04)	-53.9%
Current total GHGs (90/95-04)	-50.0%
Difference with KT	-42.0%

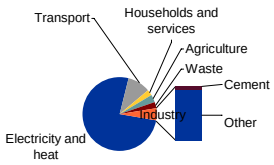
Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity	0.722	$kgCO_2$ per kWh		
Share of ren. energy (RES)	10%		▲	
Incr. of RE over 1990-2004	7%			
Access to electricity	100%			
Industry				
Emissions per t steel	0.0	tCO_2 per t steel		
Emissions per t cement		tCO_2 per t cement		
Emissions per t pulp&paper	1.1	tCO_2 per t pulp&paper		
Transport				
Emissions per capita	1.60	$tCO_2eq.$	▼	
Household & services				
Emissions per capita	0.38	$tCO_2eq.$	▼	
Agriculture				
Emissions per capita	0.56	$tCO_2eq.$	▼	
Waste				
Emissions per capita	0.40	$tCO_2eq.$	▼	
Land use change				
Emissions per capita	-5.94	$tCO_2eq.$	▲	
International aviation and shipping				
Emissions per capita	0.41	$tCO_2eq.$	▼	

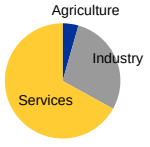
Change in production — **1990 to 2004** — **Change in emissions**



Emissions per sector 2004



GDP per sector 2004



Energy investment

Total energy research and development 2004	mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	°/₀₀	Share (per year) of total GDP	°/₀₀

Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, Annex I
National GHG targets	
Energy related targets	5.1% of electricity produced from RES by 2010. 20% of electricity generated from CHP by 2020. Keep the growth rate of energy consumption at the level of 50% of GDP. Biofuels Directive provides indicative target of 5.75% share of biofuels in transport fuel by 2010 for each member state
General climate policies	The National Environmental Strategy & National Environmental Action Plan are regularly revised (next is 2006). Sustainable Development Act. National Programme of Greenhouse Gas Emission Reduction for 2003-2012.
Electricity	EU-ETS. Long-term National Development Plan for the Fuel and Energy Sector until 2015. Keep the volume of primary energy consumption at 2003 levels until 2010.Energy efficiency measures. Tax on fossil fuels. Incentives for renewables.
Industry	IPPC act. Energy Efficiency Target Programme. CO2 tax for >50MW plants. Voluntary agreements with 7 enterprises and with the cement and lime sector.
Transport	National Transport Development Plan for 2005–2010. Promotion of biofuels. Incentives for public transport. Update of car and bus fleet.
Households	Energy labelling of household appliances. Energy efficiency in buildings. District Heating Act.
Agriculture	Rural Development Plan 2004-2006 and the EU CAP. Estonian Forestry Development Plan up to 2010.
Waste	New Waste Act (2004) promotes waste reduction and the introduction of waste management. Requirements for the Construction, Use and Closure of Landfills (2004).
CDM, JI and IET	Several JI projects already in the pipeline with Finland (2002), Netherlands (2003), Denmark (2003) and Sweden (2005). Negotiations with Austria and with Belgium in preparation phase. As of 2005 the projects resulted in 260.3 thousand t of CO2 AAU and 368.5 thousand t of CO2 ERU.

Summary

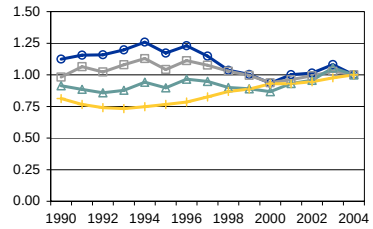
Economy: the independence from Russia in 1991 led to a period of relatively low economic performance which improved sensibly after 2000.
Emissions: in line with the economy emissions have been low over the period considered also due to a decrease in primary energy supply.
Fuels: heavily dependent on coal but with an increase of biomass in recent years.
Policy: Accessed the EU recently and the main objective is to translate EU Directives into national legislation. This includes Climate Change policies but the overall feeling is that the focus remains on economic performance rather than environmental performance.

Climate fact sheet — Finland

Economy-wide indicators

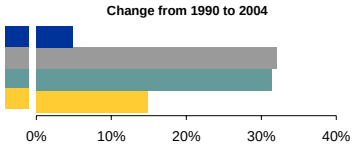
Factors driving emissions (population, GDP, energy and GHG)

Trends

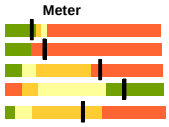


	2004		90-04	Meter
Population	5,230	ths people		
GDP (PPP)	144	bln US$ (2000)		
Prm. Energy Sply.(TPES)	37,136	ktoe		
GHG emissions	81	$MtCO_2eq.$		
GHG emissions/GDP PPP	0.564	$kgCO_2eq./US$	▼	
TPES/GDP PPP	258	toe/MUS$	▲	
GHG emissions/cap	15.5	$tCO_2eq./cap$	▲	
GDP PPP/cap	27.5	ths US$/cap	▲	
Cum. GHG 1900 to 2004	6.3	$tCO_2eq./cap/y$	▲	

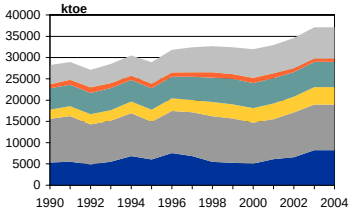
Change from 1990 to 2004



Meter



Primary energy supply

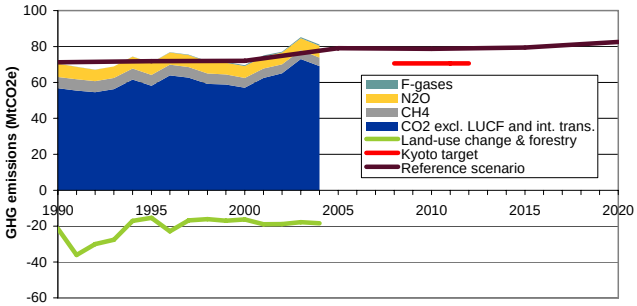


	Share in 2004
Biomass/waste	19.7%
Solar/wind/other	0.0%
Geothermal	
Hydro	2.2%
Nuclear	16.0%
Gas	11.0%
Oil	28.9%
Coal	22.2%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_20	F-gas
$0	$MtCO_2eq$					
	% gas					
	& tot.GHG					
$30	$MtCO_2eq$	12	3			
	% gas	17%	4%			
	& tot.GHG	15%	4%			

Historic and projected GHG emissions



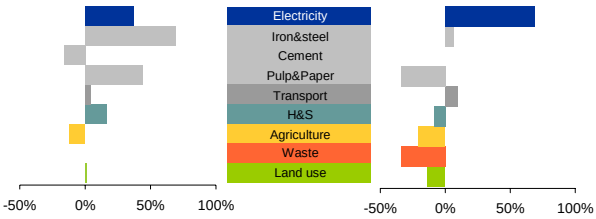
	Share in 2004
F-Gases	1%
N_2O	8%
CH_4	6%
CO_2 excluding LUCF	85%

Kyoto target (KT)	0.0%
Current CO_2 (90-04)	21.8%
Current non-CO_2 (90/95-04)	-13.6%
Current total GHGs (90/95-04)	14.8%
Difference with KT	14.8%

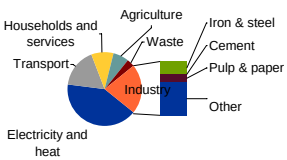
Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity	0.297	$kgCO_2$ per kWh	▲	
Share of ren. energy (RES)	22%		▲	
Incr. of RE over 1990-2004	3%			
Access to electricity	100%			
Industry				
Energy efficiency index	1.2			
Emissions per t steel	0.9	tCO_2 per t steel		
Emissions per t cement		tCO_2 per t cement		
Emissions per t pulp&paper	0.2	tCO_2 per t pulp&paper		
Transport				
Emissions per capita	2.69	$tCO_2eq.$	▲	
Household & services				
Emissions per capita	1.49	$tCO_2eq.$	▼	
Agriculture				
Emissions per capita	1.08	$tCO_2eq.$	▼	
Waste				
Emissions per capita	0.50	$tCO_2eq.$	▼	
Land use change				
Emissions per capita	-3.53	$tCO_2eq.$	▼	
International aviation and shipping				
Emissions per capita	0.57	$tCO_2eq.$	▲	

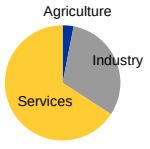
Change in production — 1990 to 2004 — Change in emissions



Emissions per sector 2004

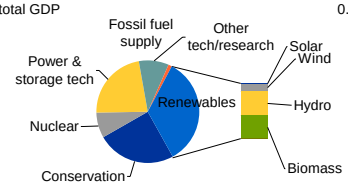


GDP per sector 2004



Energy investment

Total energy research and development 2004	13.4 mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	0.41 °/₀₀	Share (per year) of total GDP	°/₀₀



Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, Annex I
National GHG targets	
Energy related targets	Renewable Electricity Directive provides a target of 31.5% of electricity consumption from renewable sources by 2010 Biofuels Directive provides indicative target of 5.75% share of biofuels in transport fuel by 2010 for each member state
General climate policies	National Climate Strategy (2001). Environmental Protection Act (2000). Cooperation with Nordic countries for climate change policies.
Electricity	EU ETS. National Energy and Climate Strategy (NECS). Support of CHPs using biomass. Support of RES. Voluntary agreements with energy consumers.
Industry	EU ETS. Voluntary agreements for efficiency (Energy Conservation Programme). Electricity Market Act to improve competitiveness. New nuclear plant planned.
Transport	CO2 tax for transport and heating fuels. Differential vehicle taxation. Average CO2 emissions of new registered cars not to exceed 120 g/km for diesel cars and 140 g/km for petrol cars.
Households	Decrees on building regulation: heat insulation, indoor climate and ventilation of new buildings (2002). CO2 tax for heating fuels.
Agriculture	Agri-environmental support programme 2000-06 improve soil performance and management.
Waste	Waste Act 2004 and Revised National Waste Plan (2002). Waste minimisation, collection and recovery of waste paper and other waste fractions.
CDM, JI and IET	Bilateral CDM and JI projects and investments in the Baltic Sea region's Testing Ground Facility (TGF) and the World Bank Prototype Carbon Fund (PCF).

Summary

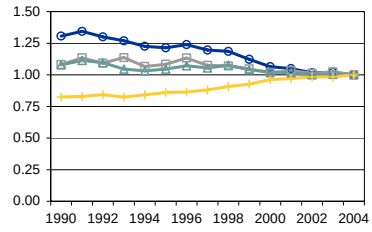
Emissions: Comparably high share of GHG emission intensive industry. Similarly to other Northern European countries, Finland has a high per capita emissions in the transport and household sector, but has decreased emissions per capita for transport. Emissions have increased in the recent years but the country could meet Kyoto target if additional measures are used.
Fuels: One of the highest % of biomass in the primary energy supply. Use of oil to meet sharp increase in energy demand over the last 10 years.
Policy: Push for nuclear and renewables in the fuel mix. Promotion for energy efficiency. Participation in JI/CDM projects.

Climate fact sheet — France

Economy-wide indicators

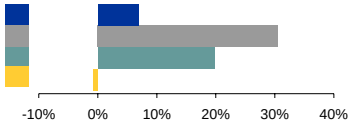
Factors driving emissions (population, GDP, energy and GHG)

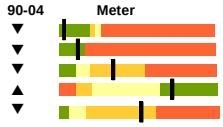
Trends



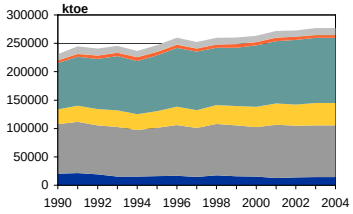
	2004		90-04	Meter
Population	62,180	ths people		
GDP (PPP)	1,626	bln US$ (2000)		
Prm. Energy Sply.(TPES)	276,963	ktoe		
GHG emissions	563	$MtCO_2eq.$		
GHG emissions/GDP PPP	0.346	$kgCO_2eq./US$	▼	
TPES/GDP PPP	170	toe/MUS$	▼	
GHG emissions/cap	9.0	$tCO_2eq./cap$	▼	
GDP PPP/cap	26.1	ths US$/cap	▲	
Cum. GHG 1900 to 2004	6.6	$tCO_2eq./cap/y$	▼	

Change from 1990 to 2004





Primary energy supply

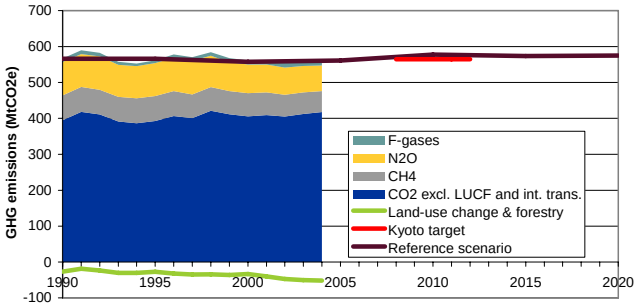


	Share in 2004
Biomass/waste	4.3%
Solar/wind/other	0.0%
Geothermal	0.0%
Hydro	1.8%
Nuclear	41.5%
Gas	14.2%
Oil	32.9%
Coal	5.2%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_20	F-gas
$0	$MtCO_2eq$					
	% gas					
	& tot.GHG					
$30	$MtCO_2eq$	22	22			
	% gas	5%	5%			
	& tot.GHG	4%	4%			

Historic and projected GHG emissions

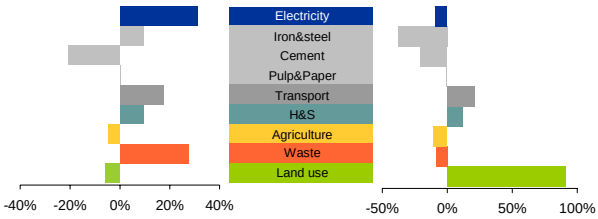


	Share in 2004
F-Gases	3%
N_2O	13%
CH_4	10%
CO_2 excluding LUCF	74%
Kyoto target (KT)	0.0%
Current CO_2 (90-04)	5.6%
Current non-CO_2 (90/95-04)	-14.4%
Current total GHGs (90/95-04)	-0.4%
Difference with KT	-0.4%

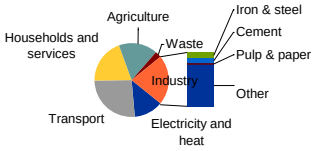
Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity	0.082	$kgCO_2$ per kWh	▼	
Share of ren. energy (RES)	6%		▼	
Incr. of RE over 1990-2004	-1%			
Access to electricity	100%			
Industry				
Energy efficiency index	1.3			
Emissions per t steel	0.6	tCO_2 per t steel		
Emissions per t cement	0.5	tCO_2 per t cement		
Emissions per t pulp&paper	1.8	tCO_2 per t pulp&paper		
Transport				
Emissions per capita	2.36	$tCO_2eq.$	▲	
Household & services				
Emissions per capita	1.79	$tCO_2eq.$	▲	
Agriculture				
Emissions per capita	1.55	$tCO_2eq.$	▼	
Waste				
Emissions per capita	0.23	$tCO_2eq.$	▼	
Land use change				
Emissions per capita	-0.83	$tCO_2eq.$	▲	
International aviation and shipping				
Emissions per capita	0.41	$tCO_2eq.$	▲	

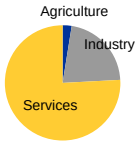
Change in production 1990 to 2004 Change in emissions



Emissions per sector 2004

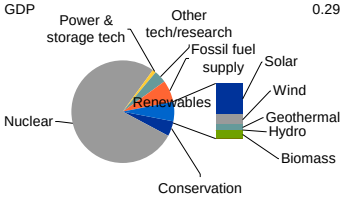


GDP per sector 2004



Energy investment

Total energy research and development 2004 5.2 mln US$ (2005)
Share of total GDP 0.29 °/₀₀



Energy infrastructure investments 2001 to 2010 mln US$ (2000)
Share (per year) of total GDP °/₀₀

Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, Annex I, Gleneagles dialogue
National GHG targets	Long-term GHG emission reduction target -75% by 2050 (compared to 1990). National energy law agreed with emphasis on reducing emissions by 3% per year.
Energy related targets	10% of energy needs produced by renewable sources by 2010 Electricity domestically produced with RE source to represent 21% of domestic electricity consumption by 2010 50% increase in heat production from renewable sources by 2010 (by increasing thermal renewable energy development) 5.75% of biofuels in transport fuel by 2008, 7% by 2010, 10% by 2015 Reduction of energy final intensity (energy consumption/growth) of 2% per year by 2015, 2.5% per year by 2030
General climate policies	Renewable energy sources, cogeneration and efficient home equipments promotion through fiscal incentives. F-gases reduction plan.
Electricity	EU ETS. Guaranteed tariffs for RE delivered. Major push for nuclear. Aims to increase RE share by 21% by 2010.
Industry	EU ETS. Voluntary agreements. Allocated €12 mn/y for energy audits.
Transport	Support for biofuels. Voluntary agreements with the automotive industry. CO2 emissions labels on new cars.
Households	Grants and income tax reduction for residential RE projects and improved insulation.
Agriculture	Long term strategy for energy production from biomass. Biogas capture project from manure.
Waste	CH4 capture from landfills.
CDM, JI and IET	CDM already in place with African countries.

Summary

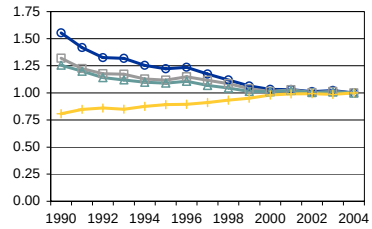
Emissions: Low GHG emission levels due to high share of nuclear electricity. Emissions currently below Kyoto target, although emissions in transports and households/services have increased, and total emissions are projected to increase.
Fuels: Over 60% of electricity supply derives from nuclear, with ninimal use of oil in the electricity fuel mix.
Policy: Very ambitious long-term GHG target. New (2006) high feed-in tariffs for renewable electricity. Participates to CDM projects with African countries.

Climate fact sheet — Germany

Economy-wide indicators

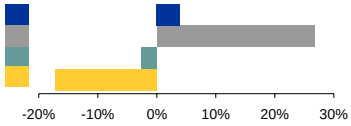
Factors driving emissions (population, GDP, energy and GHG)

Trends

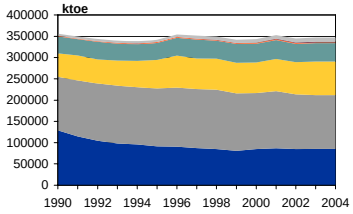


	2004		90-04	Meter
Population	82,500	ths people		
GDP (PPP)	2,146	bln US$ (2000)		
Prm. Energy Sply.(TPES)	347,159	ktoe		
GHG emissions	1,015	$MtCO_2eq.$		
GHG emissions/GDP PPP	0.473	$kgCO_2eq./US$	▼	
TPES/GDP PPP	162	toe/MUS$	▼	
GHG emissions/cap	12.3	$tCO_2eq./cap$	▼	
GDP PPP/cap	26.0	ths US$/cap	▲	
Cum. GHG 1900 to 2004	9.0	$tCO_2eq./cap/y$	▲	

Change from 1990 to 2004



Primary energy supply

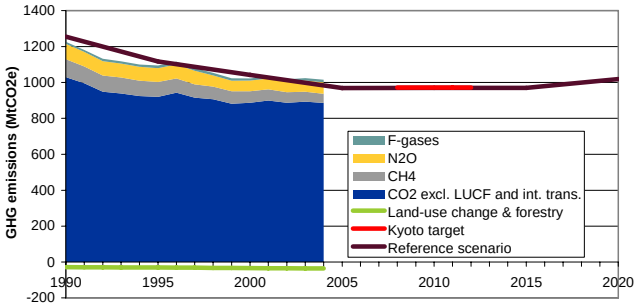


	Share in 2004
Biomass/waste	2.8%
Solar/wind/other	0.5%
Geothermal	0.0%
Hydro	0.5%
Nuclear	12.4%
Gas	22.8%
Oil	36.4%
Coal	24.5%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_2O	F-gas
$0	$MtCO_2eq$					
	% gas					
	& tot.GHG					
$30	$MtCO_2eq$	70	9			
	% gas	8%	1%			
	& tot.GHG	7%	1%			

Historic and projected GHG emissions



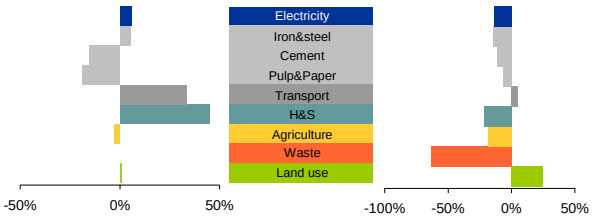
	Share in 2004
F-Gases	1%
N_2O	6%
CH_4	5%
CO_2 excluding LUCF	87%

Kyoto target (KT)	-21.0%
Current CO_2 (90-04)	-14.0%
Current non-CO_2 (90/95-04)	-35.2%
Current total GHGs (90/95-04)	-17.5%
Difference with KT	3.5%

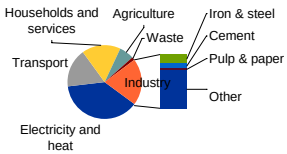
Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity	0.499	$kgCO_2$ per kWh	▼	
Share of ren. energy (RES)	4%		▲	
Incr. of RE over 1990-2004	2%			
Access to electricity	100%			
Industry				
Energy efficiency index	1.3			
Emissions per t steel	0.8	tCO_2 per t steel		
Emissions per t cement	0.6	tCO_2 per t cement		
Emissions per t pulp&paper	3.1	tCO_2 per t pulp&paper		
Transport				
Emissions per capita	2.09	$tCO_2eq.$	▲	
Household & services				
Emissions per capita	2.08	$tCO_2eq.$	▼	
Agriculture				
Emissions per capita	0.78	$tCO_2eq.$	▼	
Waste				
Emissions per capita	0.18	$tCO_2eq.$	▼	
Land use change				
Emissions per capita	-0.43	$tCO_2eq.$	▲	
International aviation and shipping				
Emissions per capita	0.32	$tCO_2eq.$	▲	

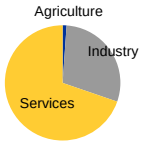
Change in production 1990 to 2004 Change in emissions



Emissions per sector 2004

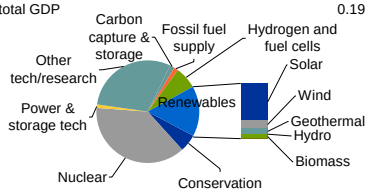


GDP per sector 2004



Energy investment

Total energy research and development 2004	36.8 mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	0.19 °/₀₀	Share (per year) of total GDP	°/₀₀



Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, Annex I, Gleneagles dialogue
National GHG targets	Long-term target of 40% GHG emission reduction by 2020 (compared to 1990) if EU commits to -30%. Aims to reduce industrial GHG emissions by 35% by 2012.
Energy related targets	Renewable Electricity Directive provides a target of 12.5% of electricity consumption from renewable sources by 2010 Biofuels Directive provides indicative target of 5.75% share of biofuels in transport fuel by 2010 for each member state
General climate policies	Eco-Tax: taxation of energy-use, revenues are used to lower labour costs
Electricity	EU ETS. Guaranteed feed-in tariffs for renewable electricity. CHP programme.
Industry	EU ETS. Energy saving ordinance for small/medium industries. Aims to reduce industrial GHG emissions by 35% by 2012.
Transport	Ecological Tax reform: tax on fossil fuels. Tax exemption for sulphur-free & bio-fuels. Voluntary efficiency enhancement from automotive industry.
Households	Favourable loans for low CO2 emitting systems in domestic sector. "100,000 PV roof" scheme. Energy saving ordinance.
Agriculture	Expansion of organic agriculture. €10 mn for "biogenic fuels & lubricants programme". Biogas ordinance. Afforestation programme.
Waste	Ordinance on landfills: gas capture and combustion. Separation of commercial waste.
CDM, JI and IET	No plans to use CDM/JI to achieve Kyoto target. Initiated the "KfW Carbon Fund" to pool industry demand for credits from CDM projects.

Summary

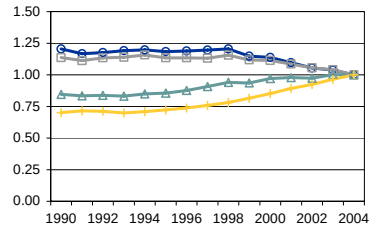
Emissions: Average GHG emission for an industrialised country, but high emission from electricity generation due to use of coal and from domestic sector. Emissions already close to Kyoto target, partly due to economic downturn in Eastern Germany but also due to national measures. However still likely to have gap to meet Kyoto target.
Fuels: Decreasing but still high share of coal in the fuel mix. Increasing use of biomass.
Policy: Renewable electricity feed-in tariffs have led to considerable increase of renewable capacity. Aims to increase electricity production from RES to 12.5% by 2010.

Climate fact sheet — Greece

Economy-wide indicators

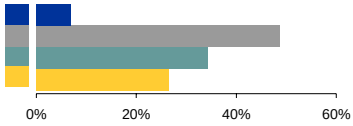
Factors driving emissions (population, GDP, energy and GHG)

Trends

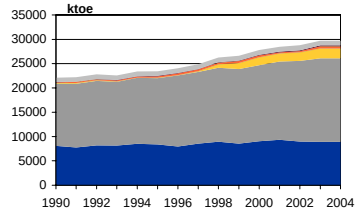


	2004		90-04	Meter
Population	11,060	ths people		
GDP (PPP)	226	bln US$ (2000)		
Prm. Energy Sply.(TPES)	29,707	ktoe		
GHG emissions	138	$MtCO_2eq.$		
GHG emissions/GDP PPP	0.610	$kgCO_2eq./US$	▼	
TPES/GDP PPP	132	toe/MUS$	▼	
GHG emissions/cap	12.4	$tCO_2eq./cap$	▲	
GDP PPP/cap	20.4	ths US$/cap	▲	
Cum. GHG 1900 to 2004	4.0	$tCO_2eq./cap/y$	▲	

Change from 1990 to 2004



Primary energy supply

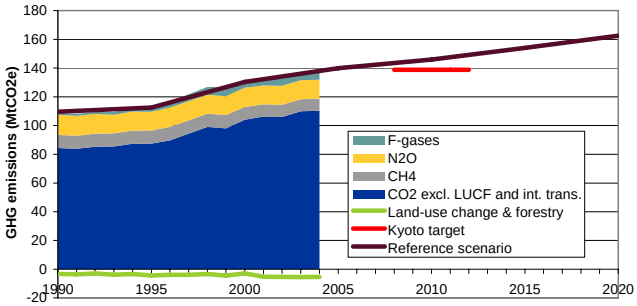


	Share in 2004
Biomass/waste	3.3%
Solar/wind/other	0.6%
Geothermal	0.0%
Hydro	1.4%
Nuclear	
Gas	6.8%
Oil	57.9%
Coal	30.0%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_2O	F-gas
$0	$MtCO_2eq$					
	% gas					
	& tot.GHG					
$30	$MtCO_2eq$	18	12			
	% gas	13%	9%			
	& tot.GHG	11%	7%			

Historic and projected GHG emissions

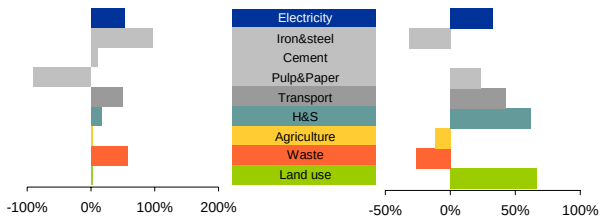


	Share in 2004
F-Gases	4%
N_2O	10%
CH_4	6%
CO_2 excluding LUCF	80%
Kyoto target (KT)	25.0%
Current CO_2 (90-04)	30.8%
Current non-CO_2 (90/95-04)	2.3%
Current total GHGs (90/95-04)	23.9%
Difference with KT	-1.1%

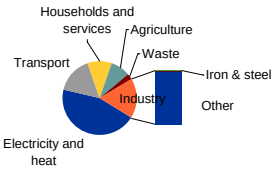
Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity	0.777	$kgCO_2$ per kWh	▼	
Share of ren. energy (RES)	5%		▲	
Incr. of RE over 1990-2004	0%			
Access to electricity	100%			
Industry				
Energy efficiency index	1.6			
Emissions per t steel	0.2	tCO_2 per t steel		
Emissions per t cement		tCO_2 per t cement		
Emissions per t pulp&paper	74.0	tCO_2 per t pulp&paper		
Transport				
Emissions per capita	2.02	$tCO_2eq.$	▲	
Household & services				
Emissions per capita	1.31	$tCO_2eq.$	▲	
Agriculture				
Emissions per capita	1.08	$tCO_2eq.$	▼	
Waste				
Emissions per capita	0.29	$tCO_2eq.$	▼	
Land use change				
Emissions per capita	-0.49	$tCO_2eq.$	▲	
International aviation and shipping				
Emissions per capita	1.22	$tCO_2eq.$	▲	

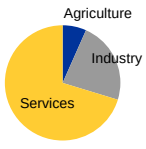
Change in production 1990 to 2004 Change in emissions



Emissions per sector 2004

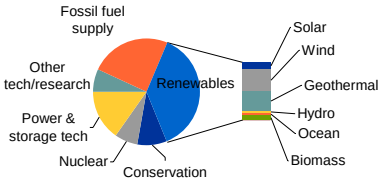


GDP per sector 2004



Energy investment

Total energy research and development 2004	4.0 mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	0.11 °/₀₀	Share (per year) of total GDP	°/₀₀



Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, Annex I
National GHG targets	
Energy related targets	Renewable Electricity Directive provides a target of 20.1% of electricity consumption from renewable sources by 2010 Biofuels to reach 5.75% of total road transport fuels' consumption by 2010.
General climate policies	2nd National Climate Change Programme 2002, Operational Programme Competitiveness (2002-06) and the Operational Programme Environment both under the 3rd Community Support Framework (3rd CSF).
Electricity	EU ETS. Promotion of gas in power generation. Improve efficiency and introduce more cogeneration plants. Feed-in tariffs for RE. Incentives for RE projects.
Industry	EU ETS. Energy efficiency programmes and promotion of RE.
Transport	Support biofuels. Improve railways and update bus fleet with more buses using gas. Voluntary agreement with car manufacturers for efficient vehicles.
Households	Energy Performance of Building. Energy efficient appliances. Energy certification of new and existing buildings.
Agriculture	Restriction of N fertilisers and promotion of organic farming.
Waste	The targets for the reduction of biodegradable wastes landfilled are 75%, 50% and 35% for the years 2010, 2013 and 2020 respectively compared to their production in 1995.
CDM, JI and IET	Expects to achieve Kyoto targets domestically without further measures.

Summary

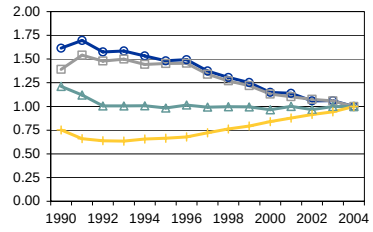
Emissions: Per capita GHG emissions are relatively high compared to the rest of Europe. The levels are expected to improve in the future with a higher penetration of gas but not in time to meet Kyoto targets. Use of oil and coal is reflected in high emission intensity in electricity generation. High emissions in the transport and household sector.
Fuels: High consumption of coal and oil due to the demand from small islands to be slowly replaced by gas. Recent increase in the use of renewables.
Policy: Feed in tariffs. Development of gas infrastructure and promotion of CHP. Limited policies on industrial activities. More policies and measures needed to reach Kyoto.

Climate fact sheet — Hungary

Economy-wide indicators

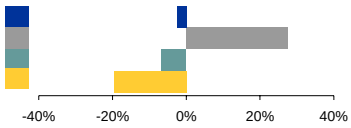
Factors driving emissions (population, GDP, energy and GHG)

Trends

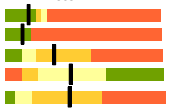


	2004		90-04	Meter
Population	10,110	ths people		
GDP (PPP)	156	bln US$ (2000)		
Prm. Energy Sply.(TPES)	25,744	ktoe		
GHG emissions	83	$MtCO_2eq.$		
GHG emissions/GDP PPP	0.532	$kgCO_2eq./US$	▼	
TPES/GDP PPP	165	toe/MUS$	▼	
GHG emissions/cap	8.2	$tCO_2eq./cap$	▼	
GDP PPP/cap	15.4	ths US$/cap	▲	
Cum. GHG 1900 to 2004	5.2	$tCO_2eq./cap/y$	▲	

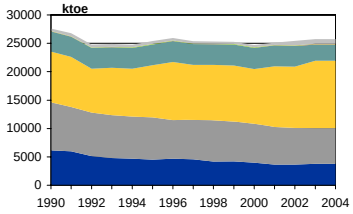
Change from 1990 to 2004



Meter



Primary energy supply

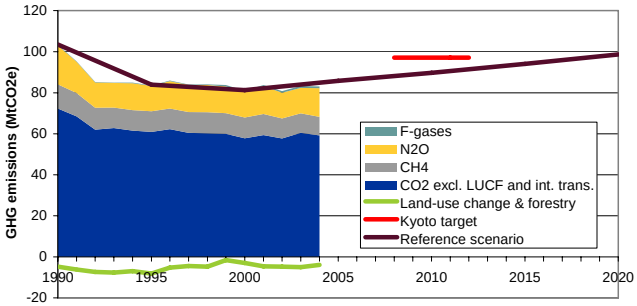


	Share in 2004
Biomass/waste	3.2%
Solar/wind/other	0.0%
Geothermal	0.3%
Hydro	0.1%
Nuclear	11.2%
Gas	46.2%
Oil	24.5%
Coal	14.6%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_20	F-gas
$0	$MtCO_2eq$					
	% gas					
	& tot.GHG					
$30	$MtCO_2eq$	1	1			
	% gas	1%	1%			
	& tot.GHG	1%	1%			

Historic and projected GHG emissions



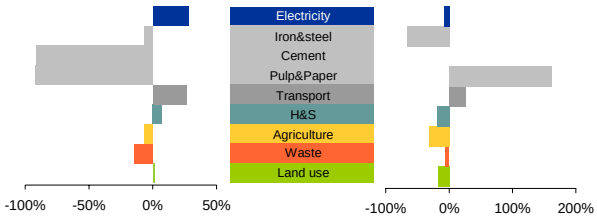
	Share in 2004
F-Gases	1%
N_2O	17%
CH_4	11%
CO_2 excluding LUCF	71%

Kyoto target (KT)	-6.0%
Current CO_2 (90-04)	-18.2%
Current non-CO_2 (90/95-04)	-22.8%
Current total GHGs (90/95-04)	-19.6%
Difference with KT	-13.6%

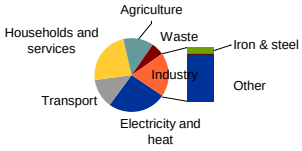
Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity	0.421	$kgCO_2$ per kWh	▼	
Share of ren. energy (RES)	4%		▲	
Incr. of RE over 1990-2004	2%			
Access to electricity	100%			
Industry				
Energy efficiency index	1.5			
Emissions per t steel	1.0	tCO_2 per t steel		
Emissions per t cement		tCO_2 per t cement		
Emissions per t pulp&paper	52.5	tCO_2 per t pulp&paper		
Transport				
Emissions per capita	1.05	$tCO_2eq.$	▲	
Household & services				
Emissions per capita	1.94	$tCO_2eq.$	▼	
Agriculture				
Emissions per capita	1.11	$tCO_2eq.$	▼	
Waste				
Emissions per capita	0.46	$tCO_2eq.$	▼	
Land use change				
Emissions per capita	-0.39	$tCO_2eq.$	▼	
International aviation and shipping				
Emissions per capita	0.06	$tCO_2eq.$	▼	

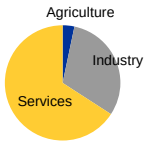
Change in production — **1990 to 2004** — **Change in emissions**



Emissions per sector 2004

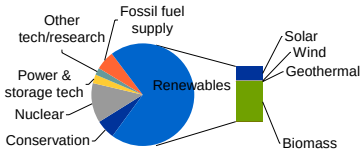


GDP per sector 2004



Energy investment

Total energy research and development 2004	0.2 mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	0.04 °/₀₀	Share (per year) of total GDP	°/₀₀



Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, Annex I
National GHG targets	Kyoto target is -6% from base year. Base year is the average of 1985-1987.
Energy related targets	Renewable Electricity Directive provides a target of 3.6% of electricity consumption from renewable sources by 2010 From 2005, 0.75% annual increase in share of automotive biofuels to 2010. 5.75% share of automotive biofuels by 2010
General climate policies	Climate Change Action Programme (2003), creation of the Energy Efficiency, Environment and Energy Information Agency. National Development Plan (2003); 2nd National Environmental Programme (2003); establishment and operation of the Environmental Protection Fund.
Electricity	EU ETS. Energy Saving Action Plan. Subsidies for RES. Funds for energy audits. Obligation to purchase electricity from cogeneration and from RES. Life extension of the Paks nuclear plant. Energy tax and environmental levy.
Industry	EU ETS. IPPC Directive. Voluntary agreements. Support for industrial energy efficiency
Transport	From 2005, 0.75% annual increase in share of automotive biofuels to 2010. Promotion of energy efficiency and CO2 labelling of new cars.
Households	"20 000 solar roofs programme". Supporting district heating projects. Funds for building insulation . Residential and communal energy efficiency programmes.
Agriculture	National Agri-environmental Programme for 2000-06. Nitrate Action Programme. Afforestation programme. Rural development programme.
Waste	Landfill Directive of the EC. National Waste Management Plan 2003-2008.
CDM, JI and IET	Creation of the Inter-ministerial Committee to review JI project proposals.

Summary

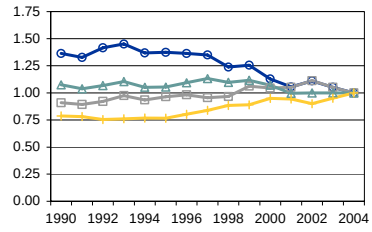
Economy: Slowly recovering from economic crisis in the past decade.
Emissions: Low per capita GHG emission compared to European average. Likely to meet Kyoto targets. High emissions per capita in the household sector but average in other sectors.
Fuels: Decreasing use of coal in favour of gas. Increase in use of biomass especially in the last 5 years.
Policy: Limited policies in the industrial and agricultural sectors

Climate fact sheet — Iceland

Economy-wide indicators

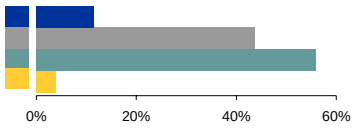
Factors driving emissions (population, GDP, energy and GHG)

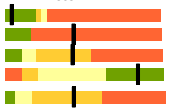
Trends



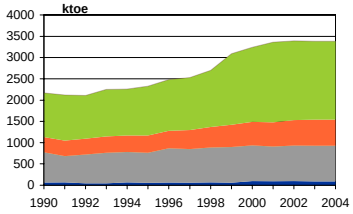
	2004		90-04	Meter
Population	290	ths people		
GDP (PPP)	9	bln US$ (2000)		
Prm. Energy Sply.(TPES)	3,386	ktoe		
GHG emissions	3	$MtCO_2eq.$		
GHG emissions/GDP PPP	0.364	$kgCO_2eq./US\$$	▼	
TPES/GDP PPP	382	toe/MUS$	▲	
GHG emissions/cap	11.1	$tCO_2eq./cap$	▼	
GDP PPP/cap	30.6	ths US$/cap	▲	
Cum. GHG 1900 to 2004	5.5	$tCO_2eq./cap/y$	▲	

Change from 1990 to 2004





Primary energy supply

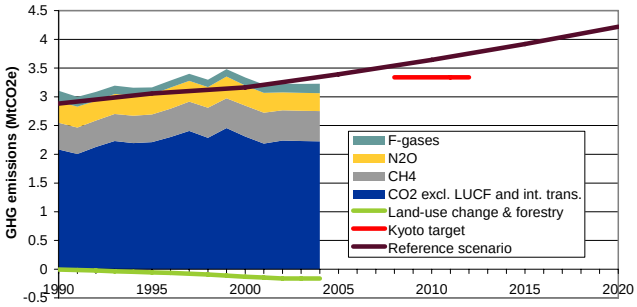


	Share in 2004
Biomass/waste	0.0%
Solar/wind/other	
Geothermal	54.5%
Hydro	18.0%
Nuclear	
Gas	
Oil	24.8%
Coal	2.7%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_20	F-gas
$0	$MtCO_2eq$					
	% gas					
	& tot.GHG					
$30	$MtCO_2eq$					
	% gas					
	& tot.GHG					

Historic and projected GHG emissions

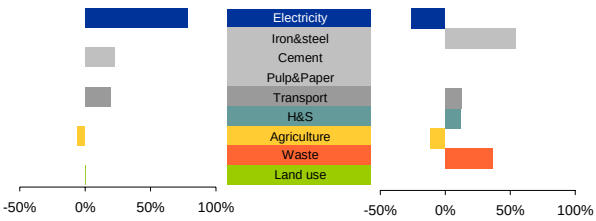


	Share in 2004
F-Gases	5%
N_2O	10%
CH_4	16%
CO_2 excluding LUCF	69%
Kyoto target (KT)	10.0%
Current CO_2 (90-04)	6.7%
Current non-CO_2 (90/95-04)	5.3%
Current total GHGs (90/95-04)	6.3%
Difference with KT	-3.7%

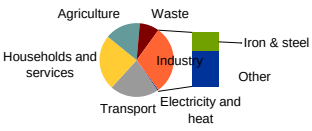
Sectoral indicators

			2004		90-04	Meter
Electricity						
Emissions intensity	0.001	$kgCO_2$ per kWh			▲	
Share of ren. energy (RES)	73%				▲	
Incr. of RE over 1990-2004	8%					
Access to electricity	100%					
Industry						
Emissions per t steel		tCO_2 per t steel				
Emissions per t cement		tCO_2 per t cement				
Emissions per t pulp&paper		tCO_2 per t pulp&paper				
Transport						
Emissions per capita	2.36	$tCO_2eq.$			▲	
Household & services						
Emissions per capita	2.69	$tCO_2eq.$			▲	
Agriculture						
Emissions per capita	1.74	$tCO_2eq.$			▼	
Waste						
Emissions per capita	0.96	$tCO_2eq.$			▲	
Land use change						
Emissions per capita	-0.56	$tCO_2eq.$			▲	
International aviation and shipping						
Emissions per capita	1.83	$tCO_2eq.$			▲	

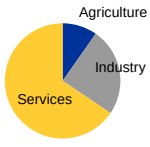
Change in production — **1990 to 2004** — **Change in emissions**



Emissions per sector 2004



GDP per sector 2004



Energy investment

Total energy research and development 2004	mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	°/₀₀	Share (per year) of total GDP	°/₀₀

Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, Annex I
National GHG targets	Reduction in GHG emissions by up to 75% by 2050, compared with 1990 levels
Energy related targets	
General climate policies	Climate change strategy (2002)." Welfare for the Future" is the sustainable development strategy (2002).
Electricity	Key objective is to increase the share of renewables.
Industry	Climate-related policies in the industrial sector are primarily focused on limiting PFC emissions. Aluminium sector (the largest in the country) has voluntarily reduced emissions.
Transport	Incentives from small diesel cars. Tax on gasoline. Tax reduction on imports of cleaner cars. 45% tax exemption of H2 cars.
Households	No particular measures.
Agriculture	Fishing is one of the highest emitting sectors in Iceland. Research grant for emissions reduction in fishing vessels. Reforestation and revegetation programmes for carbon sequestration.
Waste	25% reduction target for domestic organic waste by 2009. Increase methane recovery from landfills.
CDM, JI and IET	No interest in participating to JI/CDM projects.

Summary

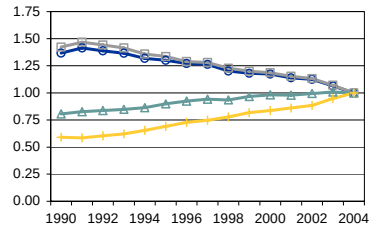
Economy: healthy growing economy.
Emissions: most come from mobile sources (vehicles and fishing vessels).
Fuels: over 70% of TPES is from renewables with the highest consumption of geothermal energy in the EU. Oil is mainly used in transport in the fishing industry.
Policy: strong emphasis in reducing PFCs in the aluminium sector (primary industry after fishing). Policies to increase the use of renewables in the transport sector. Not interested in JI/CDM projects.

Climate fact sheet — India

Economy-wide indicators

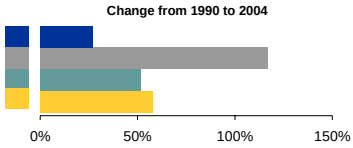
Factors driving emissions (population, GDP, energy and GHG)

Trends

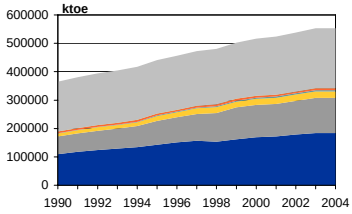


	2004		90-04	Meter
Population	1,079,720	ths people		
GDP (PPP)	3,115	bln US$ (2000)		
Prm. Energy Sply.(TPES)	553,245	ktoe		
GHG emissions	1,744	$MtCO_2eq.$		
GHG emissions/GDP PPP	0.560	$kgCO_2eq./US$	▼	
TPES/GDP PPP	178	toe/MUS$	▼	
GHG emissions/cap	1.6	$tCO_2eq./cap$	▲	
GDP PPP/cap	2.9	ths US$/cap	▲	
Cum. GHG 1900 to 2004	0.6	$tCO_2eq./cap/y$	▼	

Change from 1990 to 2004



Primary energy supply

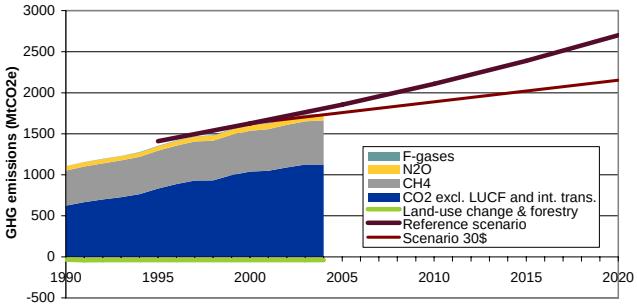


	Share in 2004
Biomass/waste	38.2%
Solar/wind/other	0.1%
Geothermal	
Hydro	1.2%
Nuclear	0.8%
Gas	4.2%
Oil	22.4%
Coal	33.2%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_20	F-gas
$0	$MtCO_2eq$			12	4	4
	% gas			2%	5%	18%
	& tot.GHG			0%	0%	0%
$30	$MtCO_2eq$	427	427	97	11	15
	% gas	22%	22%	14%	12%	66%
	& tot.GHG	16%	16%	4%	0%	1%

Historic and projected GHG emissions



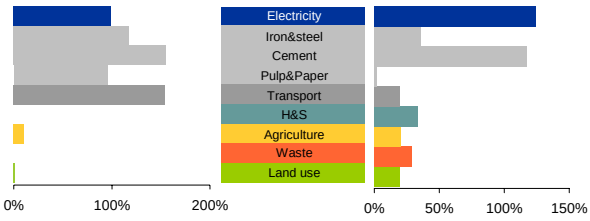
	Share in 2004
F-Gases	1%
N_2O	4%
CH_4	31%
CO_2 excluding LUCF	64%

Current CO_2 (90-04)	80.6%
Current non-CO_2 (90/95-04)	27.8%
Current total GHGs (90/95-04)	57.5%

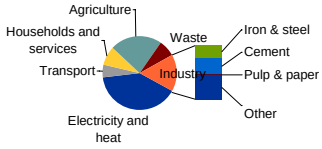
Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity	0.912	$kgCO_2$ per kWh	▲	
Share of ren. energy (RES)	39%		▼	
Incr. of RE over 1990-2004	-10%			
Access to electricity	43%			
Industry				
Energy efficiency index	1.7			
Emissions per t steel	2.0	tCO_2 per t steel		
Emissions per t cement	0.7	tCO_2 per t cement		
Emissions per t pulp&paper	1.6	tCO_2 per t pulp&paper		
Transport				
Emissions per capita	0.09	$tCO_2eq.$	▼	
Household & services				
Emissions per capita	0.14	$tCO_2eq.$	▲	
Agriculture				
Emissions per capita	0.37	$tCO_2eq.$	▼	
Waste				
Emissions per capita	0.11	$tCO_2eq.$	▲	
Land use change				
Emissions per capita	-0.04	$tCO_2eq.$	▼	
International aviation and shipping				
Emissions per capita	0.01	$tCO_2eq.$	▲	

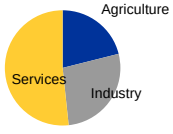
Change in production — **1990 to 2004** — **Change in emissions**



Emissions per sector 2004

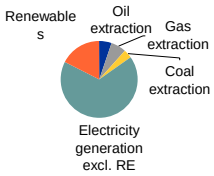


GDP per sector 2004



Energy investment

Total energy research and development 2004	mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	1710 mln US$ (2000)
Share of total GDP	°/₀₀	Share (per year) of total GDP	0.29 °/₀₀



Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, Gleneagles dialogue, AP6, G77 & China
National GHG targets	
Energy related targets	Electricity target: 10% of additional installed capacity until 2012 shall come from renewable energy sources.
General climate policies	Establishment of Ministry of Non-Conventional Energy Sources. Fiscal measures including signals about the costs of using environmental and natural resources.
Electricity	Renewable energy programme including subsidisation of renewable technologies.
Industry	Several clean coal initiatives to restructure the coal sector, including privatisation environment preservation schemes and abolishment of subsidies. Companies are obliged to report energy efficiency improvements to facilitate identification of existing potentials.
Transport	Emission limiting performance standards in big cities. National European-level emission norms. Conversion of public vehicles in Delhi from petrol to gas
Households	No particular measures.
Agriculture	Reducing deforestation by increasing the efficiency of residential stoves. Several other forest conservation measures.
Waste	No particular measures.
CDM, JI and IET	Very important host country for various CDM projects (84 registered), good developed CDM infrastructure.

Summary

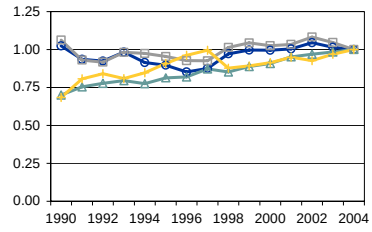
Economy: booming economy, fastest growing together with China.
Investment data: Invested $172 bn in energy projects, $30 bn of which were invested in renewable energy.
Emissions: Increasing total emissions due to population growth and increasing per capita consumption. Very low emissions per capita. Very high emission intensity for electricity generation due to a strong dependence on coal.
Fuels: High but decreasing share of residential biomass use. Efforts to increase use of renewables, but proportion in electricity supply has decreased.
Policy: Many CDM activities, good CDM infrastructure (host for 84 projects!).

Climate fact sheet — Indonesia

Economy-wide indicators

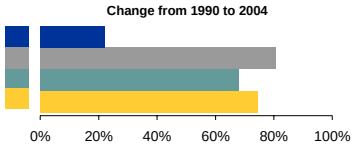
Factors driving emissions (population, GDP, energy and GHG)

Trends



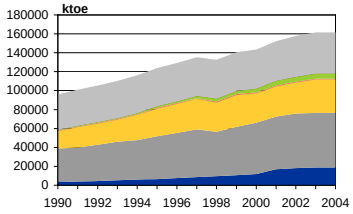
	2004	
Population	217,590	ths people
GDP (PPP)	722	bln US$ (2000)
Prm. Energy Sply.(TPES)	161,553	ktoe
GHG emissions	470	$MtCO_2eq.$
GHG emissions/GDP PPP	0.651	$kgCO_2eq./US$
TPES/GDP PPP	224	toe/MUS$
GHG emissions/cap	2.2	$tCO_2eq./cap$
GDP PPP/cap	3.3	ths US$/cap
Cum. GHG 1900 to 2004	0.6	$tCO_2eq./cap/y$

Change from 1990 to 2004



	90-04	Meter
GHG emissions/GDP PPP	▼	
TPES/GDP PPP	▼	
GHG emissions/cap	▲	
GDP PPP/cap	▲	
Cum. GHG 1900 to 2004	▲	

Primary energy supply

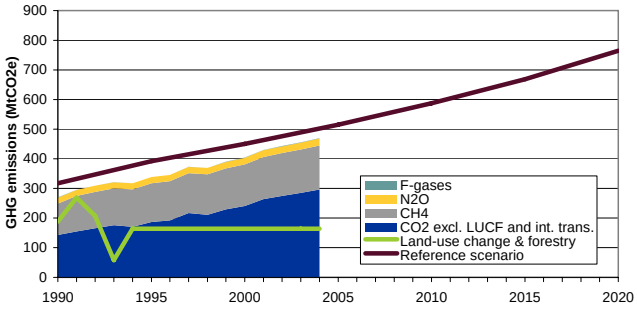


	Share in 2004
Biomass/waste	26.8%
Solar/wind/other	
Geothermal	3.4%
Hydro	0.5%
Nuclear	
Gas	21.9%
Oil	35.7%
Coal	11.6%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_2O	F-gas
$0	$MtCO_2eq$					
	% gas					
	& tot.GHG					
$30	$MtCO_2eq$					
	% gas					
	& tot.GHG					

Historic and projected GHG emissions



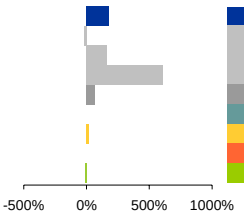
	Share in 2004
F-Gases	0%
N_2O	5%
CH_4	32%
CO_2 excluding LUCF	63%

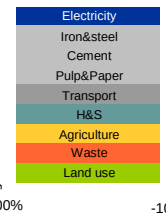
Current CO_2 (90-04)	107.7%
Current non-CO_2 (90/95-04)	36.9%
Current total GHGs (90/95-04)	74.4%

Sectoral indicators

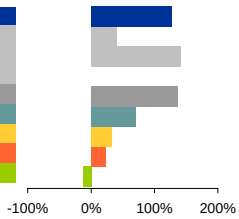
	2004		90-04	Meter
Electricity				
Emissions intensity	0.776	$kgCO_2$ per kWh	▲	
Share of ren. energy (RES)	31%		▼	
Incr. of RE over 1990-2004	-10%			
Access to electricity	53%			
Industry				
Energy efficiency index	1.6			
Emissions per t steel	2.0	tCO_2 per t steel		
Emissions per t cement	0.9	tCO_2 per t cement		
Emissions per t pulp&paper	0.7	tCO_2 per t pulp&paper		
Transport				
Emissions per capita	0.38	$tCO_2eq.$	▲	
Household & services				
Emissions per capita	0.22	$tCO_2eq.$	▲	
Agriculture				
Emissions per capita	0.46	$tCO_2eq.$	▲	
Waste				
Emissions per capita	0.06	$tCO_2eq.$	▲	
Land use change				
Emissions per capita	0.75	$tCO_2eq.$	▼	
International aviation and shipping				
Emissions per capita	0.02	$tCO_2eq.$	▲	

Change in production 1990 to 2004

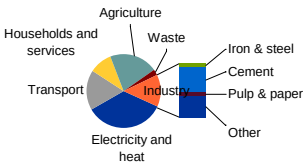




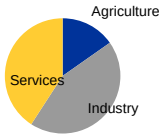
Change in emissions



Emissions per sector 2004



GDP per sector 2004



Energy investment

Total energy research and development 2004	mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	°/₀₀	Share (per year) of total GDP	°/₀₀

Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, Gleneagles dialogue, G77 & China, OPEC
National GHG targets	
Energy related targets	
General climate policies	Green Energy Policies (2002). Energy efficiency policies. Renewable energy policy. Removal of subsidies for fuels and electricity.
Electricity	Presidential instruction on supply and use of liquid coal and biofuels. Energy efficiency. Development of nuclear and geothermal energy planned. Restructuring of electricity tariffs.
Industry	Energy efficiency policy. Promotion of gas and renewable energies. Mandatory audits for industry and commercial sectors.
Transport	Use of biofuels. Promotion of public transport. Blue sky Programme for air pollution. Use of electric trains.
Households	Energy efficiency policy. Tax incentives for energy conservation compliant buildings.
Agriculture	Improving agricultural practices programme. Water management in rice cultivation. Food diversification programme.
Waste	Integrated waste management scheme, mandatory for new build. Waste minimisation programme.
CDM, JI and IET	Host country for CDM projects (2 registered) and participating in AIJ pilot projects.

Summary

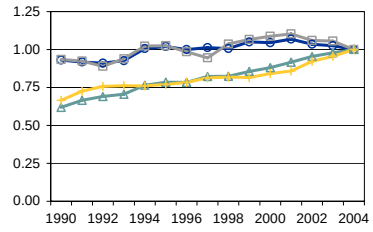
Economy: fast growing economy
Emissions: low GHG emission levels but increasing. High emission intensity in power generation due to dependence on oil.
Fuel: One of the highest biomass users in the world.

Climate fact sheet — Iran

Economy-wide indicators

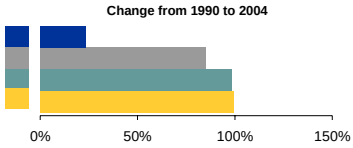
Factors driving emissions (population, GDP, energy and GHG)

Trends



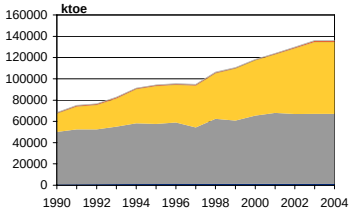
	2004	
Population	67,010	ths people
GDP (PPP)	463	bln US$ (2000)
Prm. Energy Sply.(TPES)	136,394	ktoe
GHG emissions	583	$MtCO_2eq.$

Change from 1990 to 2004



			90-04	Meter
GHG emissions/GDP PPP	1.258	$kgCO_2eq./US$	▲	
TPES/GDP PPP	294	toe/MUS$	▲	
GHG emissions/cap	8.7	$tCO_2eq./cap$	▲	
GDP PPP/cap	6.9	ths US$/cap	▲	
Cum. GHG 1900 to 2004	1.6	$tCO_2eq./cap/y$	▲	

Primary energy supply

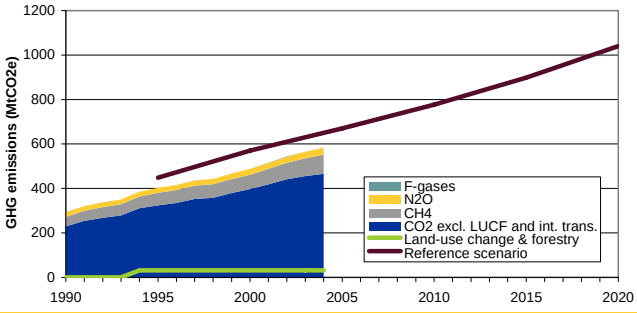


	Share in 2004
Biomass/waste	0.6%
Solar/wind/other	
Geothermal	
Hydro	0.7%
Nuclear	
Gas	49.5%
Oil	48.4%
Coal	0.8%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_20	F-gas
$0	$MtCO_2eq$					
	% gas					
	& tot.GHG					
$30	$MtCO_2eq$					
	% gas					
	& tot.GHG					

Historic and projected GHG emissions



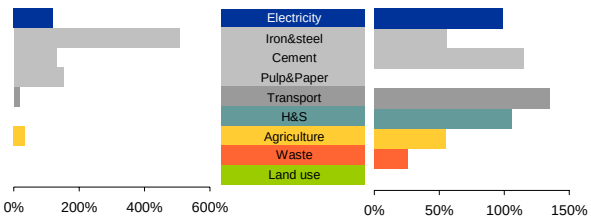
	Share in 2004
F-Gases	0%
N_2O	5%
CH_4	15%
CO_2 excluding LUCF	80%

Current CO_2 (90-04)	103.2%
Current non-CO_2 (90/95-04)	84.2%
Current total GHGs (90/95-04)	99.0%

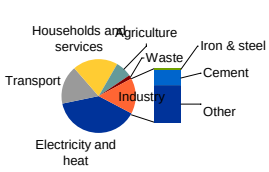
Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity	0.523	$kgCO_2$ per kWh	▼	
Share of ren. energy (RES)	1%		▼	
Incr. of RE over 1990-2004	0%			
Access to electricity	98%			
Industry				
Energy efficiency index	2.4			
Emissions per t steel	0.4	tCO_2 per t steel		
Emissions per t cement	0.9	tCO_2 per t cement		
Emissions per t pulp&paper	0.0	tCO_2 per t pulp&paper		
Transport				
Emissions per capita	1.48	$tCO_2eq.$	▲	
Household & services				
Emissions per capita	1.70	$tCO_2eq.$	▲	
Agriculture				
Emissions per capita	0.65	$tCO_2eq.$	▲	
Waste				
Emissions per capita	0.14	$tCO_2eq.$	▲	
Land use change				
Emissions per capita	0.47	$tCO_2eq.$		
International aviation and shipping				
Emissions per capita	0.07	$tCO_2eq.$	▲	

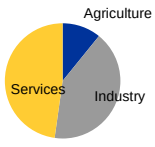
Change in production — 1990 to 2004 — Change in emissions



Emissions per sector 2004



GDP per sector 2004



Energy investment

Total energy research and development 2004	mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	°/₀₀	Share (per year) of total GDP	°/₀₀

Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, Gleneagles dialogue, G77 & China, OPEC
National GHG targets	
Energy related targets	
General climate policies	National Action Plan on Climate Change. National Strategy for Environment and Sustainable Development. Creation of the National Climate Change Office.
Electricity	Energy efficiency programme. Fuel switch (gas) in power generation. Promotion of RES in electricity generation. Flare gas recovery and storage or conversion.
Industry	Bi- or multilateral R&D and technology transfer. Identification and implementation of pilot programmes. Environmental Management Standards. Environmental Impact Assessment.
Transport	Upgrade vehicle fleet. Improve urban traffic and transport management. Planned fuel cost increase.
Households	Energy efficiency awareness programme. Water conservation awareness programme.
Agriculture	UN Convention to Combat Desertification. Water use efficiency and management. Fertilisers use management
Waste	Proposed waste minimisation and CH4 recovery from landfills for electricity generation. Basic recycling programme in place.
CDM, JI and IET	CDM projects considered but only as a host country.

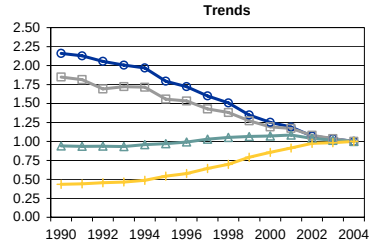
Summary

Economy: growing economy but heavily dependent on oil.
Emissions: relatively low considering that is an oil producing country. High emission intensity in electricity generation due to oil and gas use.
Fuels: Iran is OPEC's second largest oil producer and holds 9% of the world's oil reserves and 15% of its gas reserves. One of the very few oil producing countries with hydro capacity.
Policy: Climate change mitigation policies reflect the strategy for low economic impacts. CDM projects considered.

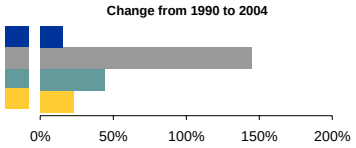
Climate fact sheet — Ireland

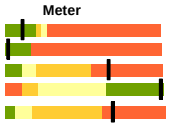
Economy-wide indicators

Factors driving emissions (population, GDP, energy and GHG)

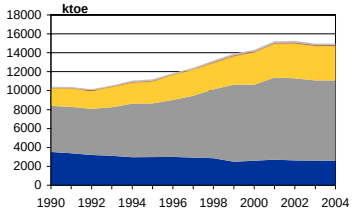


	2004		90-04	Meter
Population	4,060	ths people		
GDP (PPP)	145	bln US$ (2000)		
Prm. Energy Sply.(TPES)	14,992	ktoe		
GHG emissions	68	$MtCO_2eq.$		
GHG emissions/GDP PPP	0.472	$kgCO_2eq./US$	▼	
TPES/GDP PPP	103	toe/MUS$	▼	
GHG emissions/cap	16.9	$tCO_2eq./cap$	▲	
GDP PPP/cap	35.8	ths US$/cap	▲	
Cum. GHG 1900 to 2004	8.6	$tCO_2eq./cap/y$	▼	





Primary energy supply

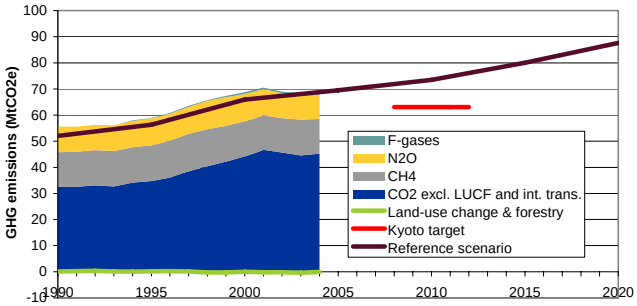


	Share in 2004
Biomass/waste	1.1%
Solar/wind/other	0.3%
Geothermal	0.0%
Hydro	0.3%
Nuclear	
Gas	24.4%
Oil	56.6%
Coal	17.3%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_20	F-gas
$0	$MtCO_2eq$					
	% gas					
	& tot.GHG					
$30	$MtCO_2eq$	12	12			
	% gas	19%	19%			
	& tot.GHG	14%	14%			

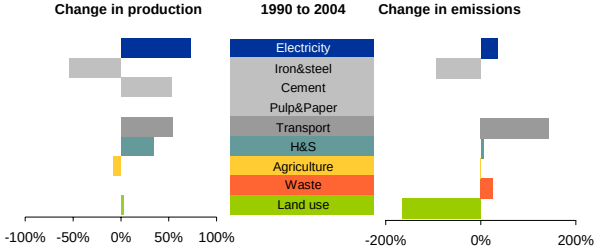
Historic and projected GHG emissions

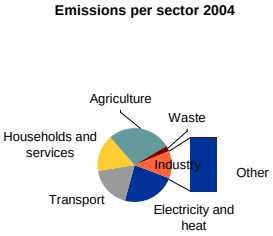


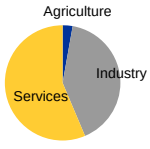
	Share in 2004
F-Gases	1%
N_2O	14%
CH_4	19%
CO_2 excluding LUCF	66%
Kyoto target (KT)	13.0%
Current CO_2 (90-04)	39.0%
Current non-CO_2 (90/95-04)	-0.1%
Current total GHGs (90/95-04)	22.7%
Difference with KT	9.7%

Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity	0.592	$kgCO_2$ per kWh	▼	
Share of ren. energy (RES)	2%		▲	
Incr. of RE over 1990-2004	0%			
Access to electricity	100%			
Industry				
Energy efficiency index	1.5			
Emissions per t steel	0.1	tCO_2 per t steel		
Emissions per t cement		tCO_2 per t cement		
Emissions per t pulp&paper		tCO_2 per t pulp&paper		
Transport				
Emissions per capita	3.10	$tCO_2eq.$	▲	
Household & services				
Emissions per capita	2.72	$tCO_2eq.$	▼	
Agriculture				
Emissions per capita	4.68	$tCO_2eq.$	▼	
Waste				
Emissions per capita	0.45	$tCO_2eq.$	▲	
Land use change				
Emissions per capita	-0.02	$tCO_2eq.$	▼	
International aviation and shipping				
Emissions per capita	0.64	$tCO_2eq.$	▲	

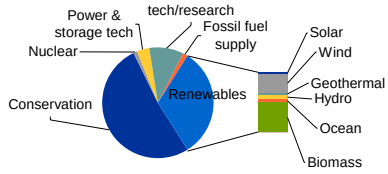






Energy investment

Total energy research and development 2004	0.1 mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	0.07 °/₀₀	Share (per year) of total GDP	°/₀₀



Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, Annex I
National GHG targets	
Energy related targets	Introduce 620 MWh capacity from RES by 2006 Renewable Electricity Directive provides a target of 13.2% of electricity consumption from renewable sources by 2010 5.75% of biofuels in transport by 2009, 10% by 2020
General climate policies	National Climate Change Strategy (2000). Carbon energy tax
Electricity	EU ETS. Green Paper on Sustainable Energy (1999). Shift to gas in electricity generation. Public Service Obligation (PSO) levy on all electricity account holders. Voluntary agreements for efficiency.
Industry	EU ETS. Voluntary agreement with the Large Industry Energy Network. Industry and Commercial R&D programme for energy efficiency.
Transport	Fuel economy labelling. Improvement of road network and public transport. Dublin Transport Initiative Strategy.
Households	Home Energy Rating. Building Regulations. Funds for energy efficiency measures in low-income households.
Agriculture	Encourage less intensive farming methods via premia, compensatory allowances. Good farming practice.
Waste	Waste Management Act (1996). Improve separation and recycling rates.
CDM, JI and IET	CDM/JI project considered

Summary

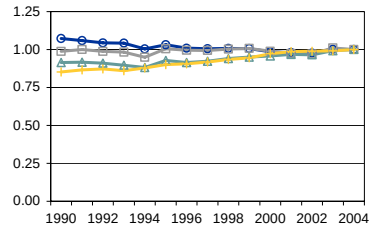
Economy: growing economy with fast GDP growth in the last decade.
Emissions: GHG emissions relatively high compared to other industrialised countries and considerably above Kyoto targets. High emission intensity in electricity generation due to high carbon fuel mix, including peat. High per capita emission in the household sector.
Fuels: decreasing use of coal but increase in gas and oil consumption.
Policy: promotion of renewable energy and energy efficiency, part of the EU ETS. CDM/JI projects considered.

Climate fact sheet — Italy

Economy-wide indicators

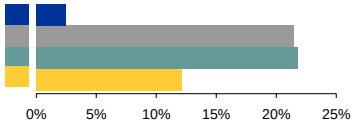
Factors driving emissions (population, GDP, energy and GHG)

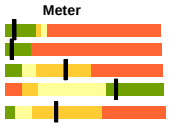
Trends



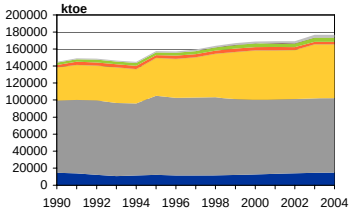
	2004		90-04	Meter
Population	58,130	ths people		
GDP (PPP)	1,491	bln US$ (2000)		
Prm. Energy Sply.(TPES)	176,643	ktoe		
GHG emissions	583	$MtCO_2eq.$		
GHG emissions/GDP PPP	0.391	$kgCO_2eq./US\$$	▼	
TPES/GDP PPP	118	toe/MUS$	▲	
GHG emissions/cap	10.0	$tCO_2eq./cap$	▲	
GDP PPP/cap	25.7	ths US$/cap	▲	
Cum. GHG 1900 to 2004	4.2	$tCO_2eq./cap/y$	▲	

Change from 1990 to 2004





Primary energy supply

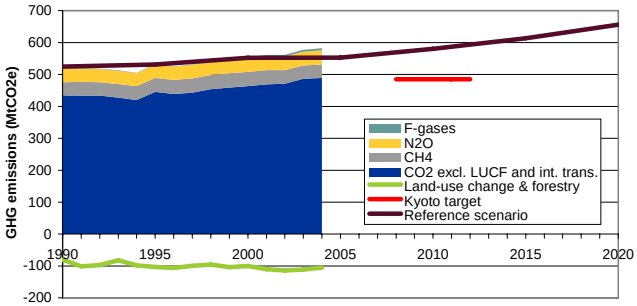


	Share in 2004
Biomass/waste	1.8%
Solar/wind/other	0.1%
Geothermal	2.7%
Hydro	1.6%
Nuclear	
Gas	35.9%
Oil	49.5%
Coal	8.4%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_20	F-gas
$0	$MtCO_2eq$					
	% gas					
	& tot.GHG					
$30	$MtCO_2eq$	12	12			
	% gas	2%	2%			
	& tot.GHG	2%	2%			

Historic and projected GHG emissions



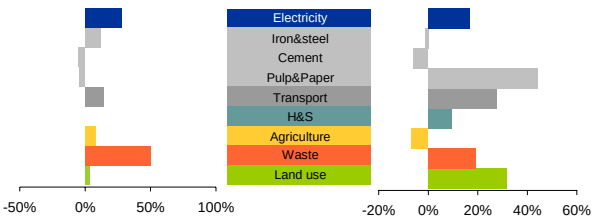
	Share in 2004
F-Gases	1%
N_2O	8%
CH_4	7%
CO_2 excluding LUCF	84%

Kyoto target (KT)	-6.5%
Current CO_2 (90-04)	12.7%
Current non-CO_2 (90/95-04)	10.1%
Current total GHGs (90/95-04)	12.3%
Difference with KT	18.8%

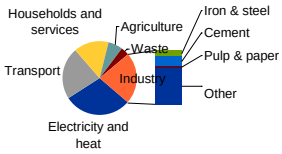
Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity	0.524	$kgCO_2$ per kWh	▼	
Share of ren. energy (RES)	6%		▲	
Incr. of RE over 1990-2004	2%			
Access to electricity	100%			
Industry				
Energy efficiency index	1.3			
Emissions per t steel	0.5	tCO_2 per t steel		
Emissions per t cement	0.6	tCO_2 per t cement		
Emissions per t pulp&paper	6.8	tCO_2 per t pulp&paper		
Transport				
Emissions per capita	2.28	$tCO_2eq.$	▲	
Household & services				
Emissions per capita	1.53	$tCO_2eq.$	▲	
Agriculture				
Emissions per capita	0.66	$tCO_2eq.$	▼	
Waste				
Emissions per capita	0.35	$tCO_2eq.$	▲	
Land use change				
Emissions per capita	-1.81	$tCO_2eq.$	▲	
International aviation and shipping				
Emissions per capita	0.25	$tCO_2eq.$	▲	

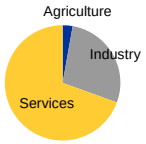
Change in production 1990 to 2004 Change in emissions



Emissions per sector 2004

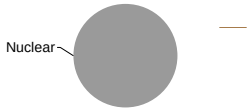


GDP per sector 2004



Energy investment

Total energy research and development 2004	mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	0.07 °/₀₀	Share (per year) of total GDP	°/₀₀



Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, Annex I, Gleneagles dialogue
National GHG targets	
Energy related targets	Aims to recover energy from 30% of municipal waste by 2010. Renewable Electricity Directive provides a target of 25% of electricity consumption from renewable sources by 2010 Biofuels Directive provides indicative target of 5.75% share of biofuels in transport fuel by 2010 for each member state
General climate policies	Promotion of energy efficiency through innovative tradable energy efficiency certificates (white certificates)
Electricity	EU ETS. Promotion of RE through obligation and tradable green certificates. Feed-in tariffs. Incentives for cogeneration.
Industry	EU ETS. Negotiated agreements.CO2 tax.
Transport	Voluntary agreement with automotive industry (FIAT). Biofuels tax exemption. Incentives for clean vehicles. Car sharing.
Households	10,000 PV roofs programme. PV and solar thermal incentives.
Agriculture	Subsidies to organic agriculture. Aims to recover energy from 30% of municipal waste by 2010.
Waste	Pilot schemes for mandatory residential waste separation and recycling at local level.
CDM, JI and IET	Mixed public/private “Italian Carbon Fund” set up to provide certificates from CDM/JI projects

Summary

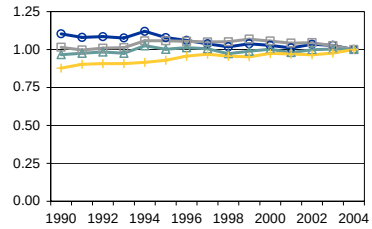
Emissions: average emissions for an industrialised country with relatively high but decreasing share of oil. Emissions considerably above Kyoto target and projected to increase substantially.
Relatively high emissions intensity in electricity supply
Fuels: highly dependent on imported gas. Strongly promotes renewable energies.
Policy: Innovative green and white certificate trading schemes in place. More policies and measures needed to reach Kyoto.

Climate fact sheet — Japan

Economy-wide indicators

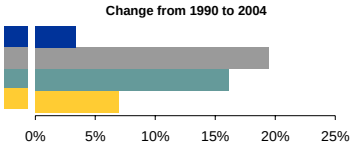
Factors driving emissions (population, GDP, energy and GHG)

Trends

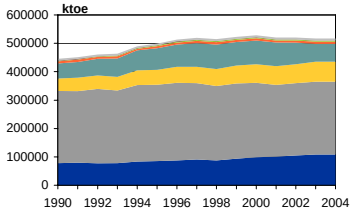


	2004		90-04	Meter
Population	127,690	ths people		
GDP (PPP)	3,435	bln US$ (2000)		
Prm. Energy Sply.(TPES)	517,103	ktoe		
GHG emissions	1,355	$MtCO_2eq.$		
GHG emissions/GDP PPP	0.394	$kgCO_2eq./US$	▼	
TPES/GDP PPP	151	toe/MUS$	▼	
GHG emissions/cap	10.6	$tCO_2eq./cap$	▲	
GDP PPP/cap	26.9	ths US$/cap	▲	
Cum. GHG 1900 to 2004	4.0	$tCO_2eq./cap/y$	▲	

Change from 1990 to 2004



Primary energy supply

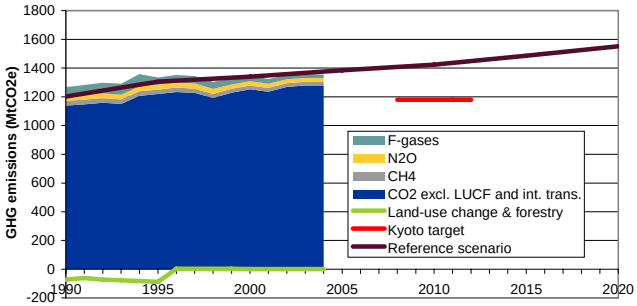


	Share in 2004
Biomass/waste	1.3%
Solar/wind/other	0.1%
Geothermal	0.6%
Hydro	1.6%
Nuclear	12.1%
Gas	13.7%
Oil	49.7%
Coal	20.8%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_20	F-gas
$0	$MtCO_2eq$			3	0	14
	% gas			14%	0%	20%
	& tot.GHG			0%	0%	1%
$30	$MtCO_2eq$			10	3	29
	% gas			48%	7%	41%
	& tot.GHG			1%	0%	2%

Historic and projected GHG emissions



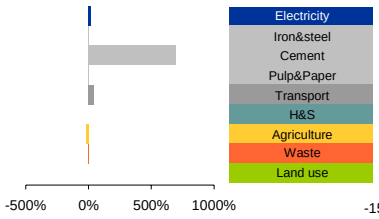
	Share in 2004
F-Gases	2%
N_2O	2%
CH_4	2%
CO_2 excluding LUCF	94%

Kyoto target (KT)	-6.0%
Current CO_2 (90-04)	12.3%
Current non-CO_2 (90/95-04)	-34.8%
Current total GHGs (90/95-04)	8.0%
Difference with KT	14.0%

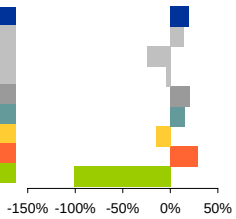
Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity	0.441	$kgCO_2$ per kWh	▲	
Share of ren. energy (RES)	4%		▲	
Incr. of RE over 1990-2004	0%			
Access to electricity	100%			
Industry				
Energy efficiency index	1.1			
Emissions per t steel	0.6	tCO_2 per t steel		
Emissions per t cement	0.7	tCO_2 per t cement		
Emissions per t pulp&paper	1.2	tCO_2 per t pulp&paper		
Transport				
Emissions per capita	2.04	$tCO_2eq.$	▲	
Household & services				
Emissions per capita	1.47	$tCO_2eq.$	▲	
Agriculture				
Emissions per capita	0.22	$tCO_2eq.$	▼	
Waste				
Emissions per capita	0.37	$tCO_2eq.$	▲	
Land use change				
Emissions per capita	0.01	$tCO_2eq.$	▼	
International aviation and shipping				
Emissions per capita	0.31	$tCO_2eq.$	▲	

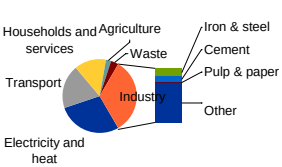
Change in production 1990 to 2004



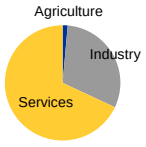
Change in emissions



Emissions per sector 2004

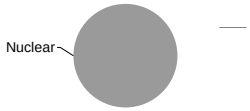


GDP per sector 2004



Energy investment

Total energy research and development 2004	mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	0.61 °/₀₀	Share (per year) of total GDP	°/₀₀



Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, Annex I, Gleneagles dialogue, AP6
National GHG targets	
Energy related targets	
General climate policies	Voluntary emission trading scheme since 05/2005 with subsidies for the 32 participants. Planned carbon tax by 2007. Kyoto Protocol Target Achievement Plan in place to meet targets
Electricity	Major push for nuclear. Shift towards natural gas (LNG). R&D programmes and grants for RE.
Industry	80% of industry under Keidanren Voluntary Action Plan for energy conservation. Industrial emissions at same 1990 levels by 2010 under Keidanren. Reporting of CO2 emissions mandatory for large emitters from 2006. Obligatory energy management systems for large factories and commercial buildings.
Transport	Obligatory energy management systems for emitters in the transport sector. Clean Vehicles programmes for highly efficient vehicles. Development of infrastructures (rail network).
Households	Enhancing efficiency of household appliances through “top runner” standards.
Agriculture	Promotion of livestock and farmland management. Introduction of NO2 abating technology in adipic acid production
Waste	Combined household treatments (Johkasou)
CDM, JI and IET	Early involvement in CDM/JI projects. Government plans to achieve at least 1.6% of the 6% Kyoto target from CDM and JI and 3.9% from carbon sinks.

Summary

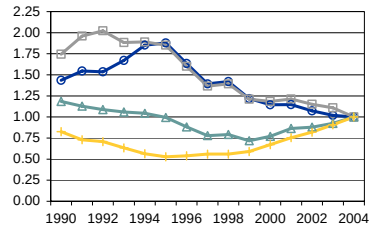
Emissions: relatively low GHG emission rates compared to average industrialised countries due to high efficiency and use of nuclear power. Increasing emissions and large distance to Kyoto target.
Fuels: Nuclear friendly but increasing use of gas especially Liquid Natural Gas (LNG). Grants for renewable energies.
Policy: No mandatory emission reduction scheme based on market mechanisms.

Climate fact sheet — Kazakhstan

Economy-wide indicators

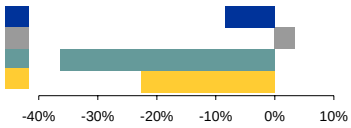
Factors driving emissions (population, GDP, energy and GHG)

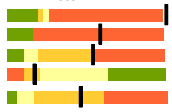
Trends



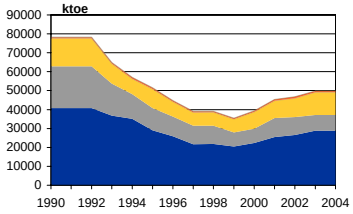
	2004		90-04	Meter
Population	14,990	ths people		
GDP (PPP)	103	bln US$ (2000)		
Prm. Energy Sply.(TPES)	49,955	ktoe		
GHG emissions	211	$MtCO_2eq.$		
GHG emissions/GDP PPP	2.056	$kgCO_2eq./US$	▼	
TPES/GDP PPP	487	toe/MUS$	▼	
GHG emissions/cap	14.1	$tCO_2eq./cap$	▼	
GDP PPP/cap	6.8	ths US$/cap	▲	
Cum. GHG 1900 to 2004	5.9	$tCO_2eq./cap/y$	▲	

Change from 1990 to 2004





Primary energy supply

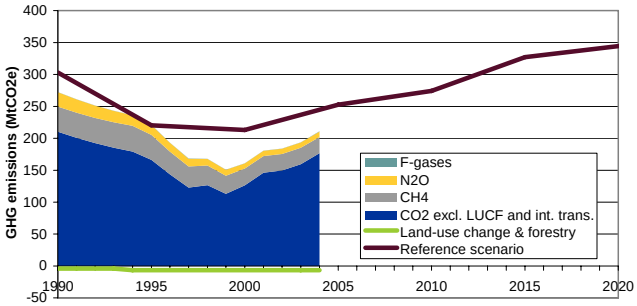


	Share in 2004
Biomass/waste	0.1%
Solar/wind/other	
Geothermal	
Hydro	1.5%
Nuclear	
Gas	24.0%
Oil	16.7%
Coal	57.7%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_20	F-gas
$0	$MtCO_2eq$					
	% gas					
	& tot.GHG					
$30	$MtCO_2eq$					
	% gas					
	& tot.GHG					

Historic and projected GHG emissions



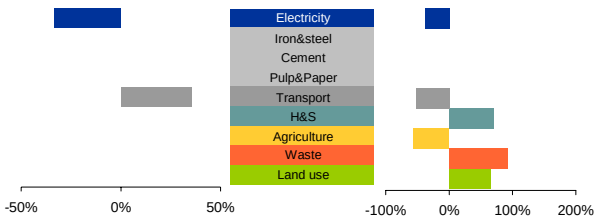
	Share in 2004
F-Gases	0%
N_2O	4%
CH_4	12%
CO_2 excluding LUCF	84%

Current CO_2 (90-04)	-16.0%
Current non-CO_2 (90/95-04)	-45.1%
Current total GHGs (90/95-04)	-22.6%

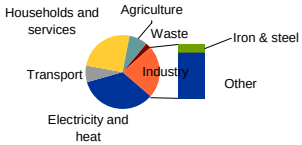
Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity	1.116	$kgCO_2$ per kWh		
Share of ren. energy (RES)	2%		▲	
Incr. of RE over 1990-2004	1%			
Access to electricity				
Industry				
Energy efficiency index	2.5			
Emissions per t steel	1.4	tCO_2 per t steel		
Emissions per t cement		tCO_2 per t cement		
Emissions per t pulp&paper		tCO_2 per t pulp&paper		
Transport				
Emissions per capita	1.04	$tCO_2eq.$	▼	
Household & services				
Emissions per capita	3.54	$tCO_2eq.$	▲	
Agriculture				
Emissions per capita	1.14	$tCO_2eq.$	▼	
Waste				
Emissions per capita	0.33	$tCO_2eq.$	▲	
Land use change				
Emissions per capita	-0.44	$tCO_2eq.$	▲	
International aviation and shipping				
Emissions per capita	0.08	$tCO_2eq.$	▲	

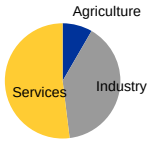
Change in production 1990 to 2004 Change in emissions



Emissions per sector 2004



GDP per sector 2004



Energy investment

Total energy research and development 2004	mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	°/₀₀	Share (per year) of total GDP	°/₀₀

Policies affecting greenhouse gas emissions

Member to climate agreements or groups	UNFCCC, Annex I
National GHG targets	Is now Annex I country under the Kyoto Protocol upon request. Target needs to be defined after Kazakhstan ratifies Kyoto Protocol.
Energy related targets	
General climate policies	GHG mitigation measures focused on the energy sector: National Energy Saving Program. Frameworks in place but measures to enable implementation not developed.
Electricity	Measures to increase energy efficiency at fossil plants, improve district heating and increase share of natural gas. Measures to include renewables in electricity generation, including project to remove barriers to wind energy development. Solar and small hydro also priority renewables.
Industry	Priority stated to increase energy efficiency and energy saving.
Transport	
Households	Priority stated to increase energy saving and improve district heating.
Agriculture	Afforestation measures plus measures to increase livestock productivity, take less productive land out of crop rotation and intensify grain production.
Waste	
CDM, JI and IET	Not yet ratified Kyoto Protocol.

Summary

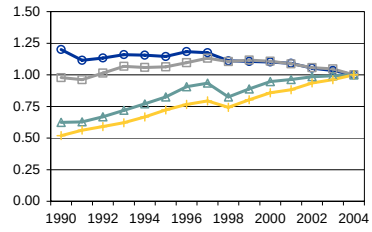
Economy: slowly recovering from economic crisis in the past decade.
Emissions: per capita GHG emission in line with European average. Likely to meet Kyoto targets. High emissions per capita in the household sector but average in other sectors.
Fuels: Highly dependent on coal and gas, plans to introduce renewable energies in power generation.
Policy: Not ratified Kyoto Protocol yet. Energy efficiency and agricultural policies in place.

Climate fact sheet — Korea (South)

Economy-wide indicators

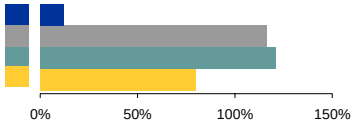
Factors driving emissions (population, GDP, energy and GHG)

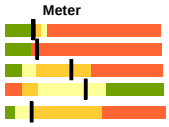
Trends



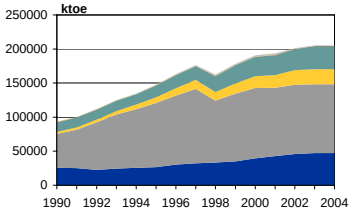
	2004		90-04	Meter
Population	48,080	ths people		
GDP (PPP)	906	bln US$ (2000)		
Prm. Energy Sply.(TPES)	205,300	ktoe		
GHG emissions	527	$MtCO_2eq.$		
GHG emissions/GDP PPP	0.581	$kgCO_2eq./US$	▼	
TPES/GDP PPP	227	toe/MUS$	▲	
GHG emissions/cap	11.0	$tCO_2eq./cap$	▲	
GDP PPP/cap	18.8	ths US$/cap	▲	
Cum. GHG 1900 to 2004	2.3	$tCO_2eq./cap/y$	▲	

Change from 1990 to 2004





Primary energy supply

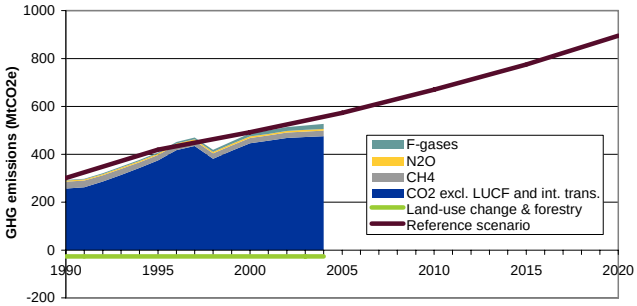


	Share in 2004
Biomass/waste	0.4%
Solar/wind/other	0.0%
Geothermal	0.0%
Hydro	0.2%
Nuclear	16.5%
Gas	10.7%
Oil	49.3%
Coal	22.9%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_2O	F-gas
$0	$MtCO_2eq$			6	0	19
	% gas			15%	0%	28%
	& tot.GHG			1%	0%	2%
$30	$MtCO_2eq$			11	3	40
	% gas			28%	16%	58%
	& tot.GHG			1%	0%	4%

Historic and projected GHG emissions



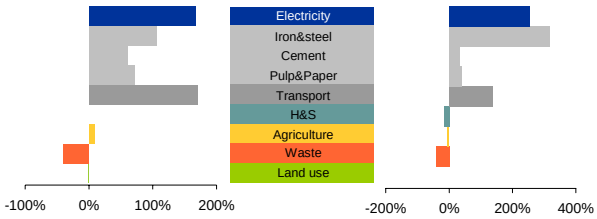
	Share in 2004
F-Gases	4%
N_2O	1%
CH_4	4%
CO_2 excluding LUCF	90%

Current CO_2 (90-04)	85.4%
Current non-CO_2 (90/95-04)	32.0%
Current total GHGs (90/95-04)	78.4%

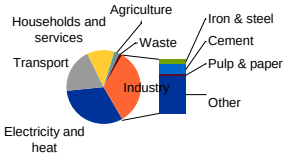
Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity	0.437	$kgCO_2$ per kWh	▼	
Share of ren. energy (RES)	1%		▼	
Incr. of RE over 1990-2004	0%			
Access to electricity	100%			
Industry				
Energy efficiency index	1.0			
Emissions per t steel	0.3	tCO_2 per t steel		
Emissions per t cement	0.6	tCO_2 per t cement		
Emissions per t pulp&paper	6.3	tCO_2 per t pulp&paper		
Transport				
Emissions per capita	2.13	$tCO_2eq.$	▲	
Household & services				
Emissions per capita	1.30	$tCO_2eq.$	▼	
Agriculture				
Emissions per capita	0.25	$tCO_2eq.$	▼	
Waste				
Emissions per capita	0.14	$tCO_2eq.$	▼	
Land use change				
Emissions per capita	-0.55	$tCO_2eq.$	▼	
International aviation and shipping				
Emissions per capita	0.54	$tCO_2eq.$	▲	

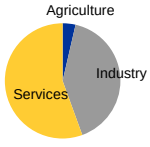
Change in production — **1990 to 2004** — **Change in emissions**



Emissions per sector 2004

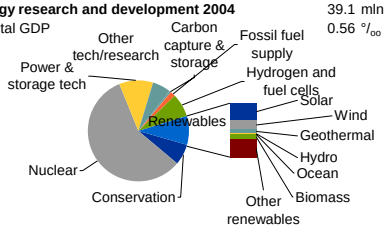


GDP per sector 2004



Energy investment

Total energy research and development 2004	39.1 mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	0.56 °/₀₀	Share (per year) of total GDP	°/₀₀



Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, Gleneagles dialogue, AP6
National GHG targets	
Energy related targets	
General climate policies	Comprehensive Action Plan. Voluntary agreement with industry sector.
Electricity	Energy conservation policy. Efficiency programme. Promotion of renewable and nuclear.
Industry	3 yr plan for energy audit. Voluntary agreement. Promotion of gas. Energy efficiency standards and labelling programme.
Transport	transport mode sharing programme. Transport management and promotion of public transport.
Households	Mandatory standards for building insulation and energy efficient design. Green building certification programme. Energy efficiency labelling programme.
Agriculture	CH4 management programme. Improving farming practices programme. Promotion of landfill gas projects.
Waste	Waste minimisation and recycling programme.
CDM, JI and IET	Host country for CDM projects (6 registered)

Summary

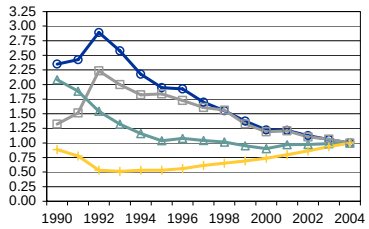
Emissions: relatively low GHG emission rates compared to average industrialised countries due to high efficiency and use of nuclear power. Increasing emissions and large distance to Kyoto target.
Fuels: large % of nuclear, high oil prices have favoured the switch to gas.
Policy: focus on energy efficiency and renewable energies.

Climate fact sheet — Latvia

Economy-wide indicators

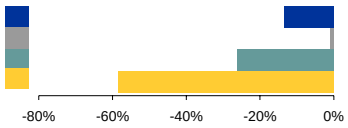
Factors driving emissions (population, GDP, energy and GHG)

Trends

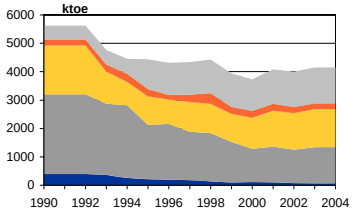


	2004		90-04	Meter
Population	2,310	ths people		
GDP (PPP)	25	bln US$ (2000)		
Prm. Energy Sply.(TPES)	4,149	ktoe		
GHG emissions	11	$MtCO_2eq.$		
GHG emissions/GDP PPP	0.434	$kgCO_2eq./US$	▼	
TPES/GDP PPP	167	toe/MUS$	▼	
GHG emissions/cap	4.7	$tCO_2eq./cap$	▼	
GDP PPP/cap	10.7	ths US$/cap	▲	
Cum. GHG 1900 to 2004	2.6	$tCO_2eq./cap/y$	▲	

Change from 1990 to 2004



Primary energy supply

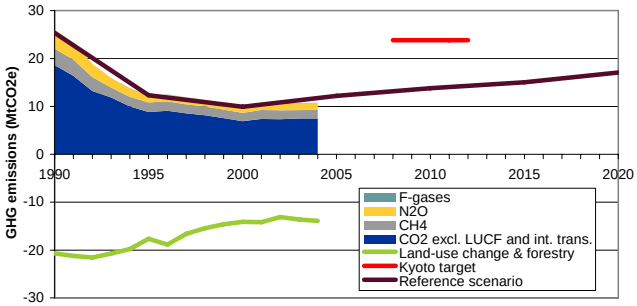


	Share in 2004
Biomass/waste	30.5%
Solar/wind/other	0.1%
Geothermal	
Hydro	4.7%
Nuclear	
Gas	32.5%
Oil	30.6%
Coal	1.6%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_20	F-gas
$0	$MtCO_2eq$					
	% gas					
	& tot.GHG					
$30	$MtCO_2eq$					
	% gas					
	& tot.GHG					

Historic and projected GHG emissions



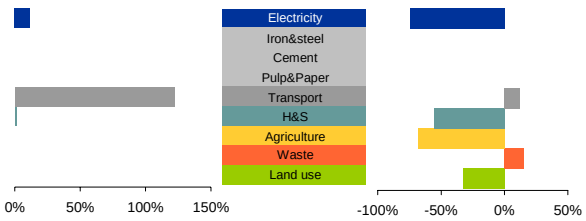
	Share in 2004
F-Gases	0%
N_2O	13%
CH_4	17%
CO_2 excluding LUCF	70%

Kyoto target (KT)	-8.0%
Current CO_2 (90-04)	-59.8%
Current non-CO_2 (90/95-04)	-55.2%
Current total GHGs (90/95-04)	-58.5%
Difference with KT	-50.5%

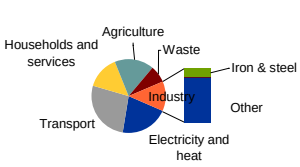
Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity	0.181	$kgCO_2$ per kWh		
Share of ren. energy (RES)	35%		▲	
Incr. of RE over 1990-2004	23%			
Access to electricity				
Industry				
Emissions per t steel	0.4	tCO_2 per t steel		
Emissions per t cement		tCO_2 per t cement		
Emissions per t pulp&paper	5.0	tCO_2 per t pulp&paper		
Transport				
Emissions per capita	1.25	$tCO_2eq.$	▲	
Household & services				
Emissions per capita	0.67	$tCO_2eq.$	▼	
Agriculture				
Emissions per capita	0.80	$tCO_2eq.$	▼	
Waste				
Emissions per capita	0.34	$tCO_2eq.$	▲	
Land use change				
Emissions per capita	-6.02	$tCO_2eq.$	▼	
International aviation and shipping				
Emissions per capita	0.36	$tCO_2eq.$	▲	

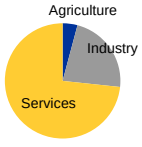
Change in production — **1990 to 2004** — **Change in emissions**



Emissions per sector 2004



GDP per sector 2004



Energy investment

Total energy research and development 2004	mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	°/₀₀	Share (per year) of total GDP	°/₀₀

Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, Annex I
National GHG targets	
Energy related targets	Renewable Electricity Directive provides a target of 49.3% of electricity consumption from renewable sources by 2010 Biofuels Directive provides indicative target of 5.75% share of biofuels in transport fuel by 2010 for each member state
General climate policies	Climate change policy in Latvia is based on EU climate policy.
Electricity	EU-ETS. Energy Law, Law on Excise Tax, Natural Resources Tax Law. Energy Policy in the Power Sector (2001). Feed in tariffs. Promotion of renewables and CHP. CO2 tax.
Industry	Law on Pollution (2001) for direct emissions reduction measures by sector. Strategy for the Development of Industry 2004-2013 for the adoption of clean technologies and BAT. Several F-gases regulations.
Transport	Law on Biofuel. Energy efficiency and audits for cars.
Households	Labelling programme for efficient electric appliances.
Agriculture	Law on Agriculture and rural development (2004). "LEADER +" initiative, Fund for the National Programme for Specially Supported Territories for updating of agricultural practices. Good agricultural practices.
Waste	Law on waste management (amended in 2004). Waste Management Plan for 2003-2012. Biogas collection from landfills.
CDM, JI and IET	Latvia has not yet decided about participation in CDM. Bilateral agreements with Denmark (2003), Austria (2003), Germany (2003 and 2004), the Netherlands (2000) and Finland(2000). Joined the “Establishment of the Testing Ground for Flexible Mechanisms of the Kyoto Protocol” within the framework of the Baltic Sea Region Energy Co-operation (BASREC) in 2004.

Summary

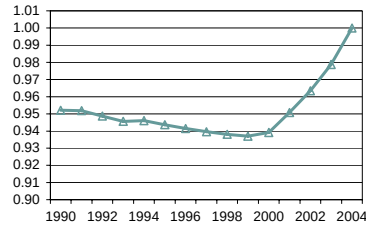
Economy: growing economy since the independence from Russia.
Emissions: decreasing over the period considered in all sectors apart from transport.
Fuels: one of the highest shares of biomass in the European countries and consequently of renewable electricity.
Policy: Focused on energy efficiency and on the promotion of renewable energies. Actively participating in JI projects.

Climate fact sheet — Liechtenstein

Economy-wide indicators

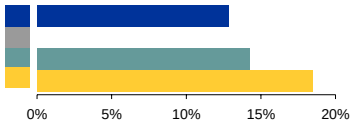
Factors driving emissions (population, GDP, energy and GHG)

Trends

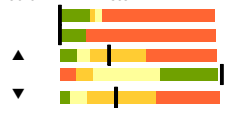


	2004	
Population	33	ths people
GDP (PPP)	2	bln US$ (2000)
Prm. Energy Sply.(TPES)	92	ktoe
GHG emissions	0	$MtCO_2eq.$
GHG emissions/GDP PPP	0.152	$kgCO_2eq./US$
TPES/GDP PPP	51	toe/MUS$
GHG emissions/cap	8.3	$tCO_2eq./cap$
GDP PPP/cap	54.8	ths US$/cap
Cum. GHG 1900 to 2004	4.6	$tCO_2eq./cap/y$

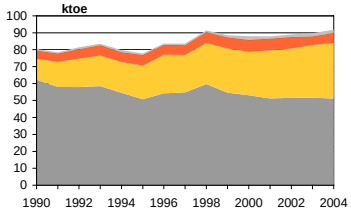
Change from 1990 to 2004



90-04 **Meter**



Primary energy supply

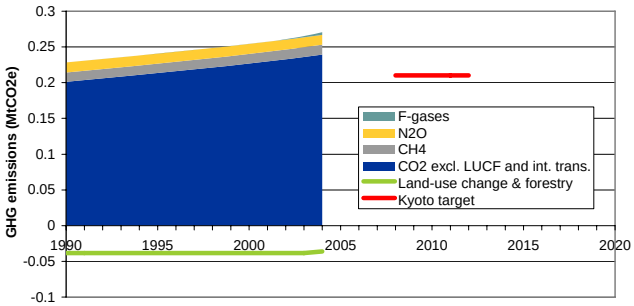


	Share in 2004
Biomass/waste	2.2%
Solar/wind/other	
Geothermal	
Hydro	6.4%
Nuclear	
Gas	35.7%
Oil	55.7%
Coal	0.0%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_20	F-gas
$0	$MtCO_2eq$					
	% gas					
	& tot.GHG					
$30	$MtCO_2eq$					
	% gas					
	& tot.GHG					

Historic and projected GHG emissions

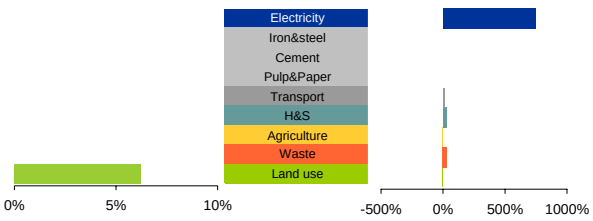


	Share in 2004
F-Gases	1%
N_2O	5%
CH_4	5%
CO_2 excluding LUCF	88%
Kyoto target (KT)	-8.0%
Current CO_2 (90-04)	18.8%
Current non-CO_2 (90/95-04)	16.4%
Current total GHGs (90/95-04)	18.5%
Difference with KT	26.5%

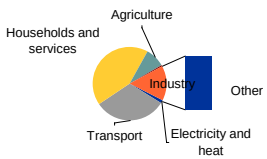
Sectoral indicators

	2004		90-04 Meter
Electricity			
Emissions intensity		$kgCO_2$ per kWh	
Share of ren. energy (RES)	9%		▲
Incr. of RE over 1990-2004	1%		
Access to electricity			
Industry			
Emissions per t steel		tCO_2 per t steel	
Emissions per t cement		tCO_2 per t cement	
Emissions per t pulp&paper		tCO_2 per t pulp&paper	
Transport			
Emissions per capita	2.64	$tCO_2eq.$	▼
Household & services			
Emissions per capita	3.52	$tCO_2eq.$	▲
Agriculture			
Emissions per capita	0.71	$tCO_2eq.$	▼
Waste			
Emissions per capita	0.06	$tCO_2eq.$	▲
Land use change			
Emissions per capita	-1.11	$tCO_2eq.$	▼
International aviation and shipping			
Emissions per capita	#####	$tCO_2eq.$	

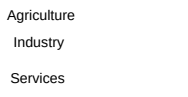
Change in production **1990 to 2004** **Change in emissions**



Emissions per sector 2004



GDP per sector 2004



Energy investment

Total energy research and development 2004	mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	°/₀₀	Share (per year) of total GDP	°/₀₀

Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, Annex I
National GHG targets	
Energy related targets	
General climate policies	The Clean Air Act (2003) introduces the possibility of a CO2 tax.
Electricity	Energy Ordinance (1993) regulates energy efficiency. Liechtenstein Energy Concept 2013 for subsidies and promotion of biomass and PV.
Industry	Liechtenstein is bound by the Customs Treaty with Switzerland in some areas (e.g. Substance Ordinance, VOC tax, SO2 tax)
Transport	Subsidies to electric scooters/ bicycles. Tax exemptions for solar, hybrid, electronic, and natural gas vehicles. Heavy Vehicle Fee. Promotion of public transport.
Households	Revised Construction Act for insulation of heaters, ventilation systems and similar devices. Energy conservation in buildings is incentivised. Green electricity programme.
Agriculture	Law on Compensation for Ecological and Animal-Friendly Practices in Agriculture (Compensation Act). Promotion of integrated production and organic farming. Forestry Act (1991) fro forest preservation.
Waste	No particular measures.
CDM, JI and IET	Liechtenstein is striving for a hosting solution in collaboration with Switzerland. Administrative cooperation is also being considered with respect to the assessment and implementation of projects in the framework of JI/CDM.

Summary

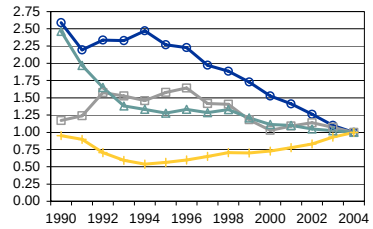
Emissions: Increasing over the period considered especially in the electricity sector. Unlikely to reach the Kyoto target unless additional measures are implemented.
Policy: Climate protection is very high in the agenda. Many policies are shared with Switzerland.

Climate fact sheet — Lithuania

Economy-wide indicators

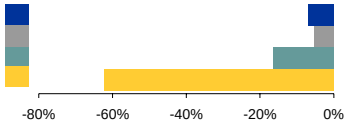
Factors driving emissions (population, GDP, energy and GHG)

Trends

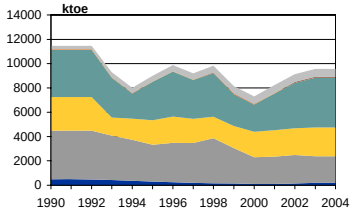


	2004		90-04	Meter
Population	3,440	ths people		
GDP (PPP)	41	bln US$ (2000)		
Prm. Energy Sply.(TPES)	9,577	ktoe		
GHG emissions	20	$MtCO_2eq.$		
GHG emissions/GDP PPP	0.488	$kgCO_2eq./US$	▼	
TPES/GDP PPP	231	toe/MUS$	▼	
GHG emissions/cap	5.9	$tCO_2eq./cap$	▼	
GDP PPP/cap	12.0	ths US$/cap	▲	
Cum. GHG 1900 to 2004	5.5	$tCO_2eq./cap/y$	▲	

Change from 1990 to 2004



Primary energy supply

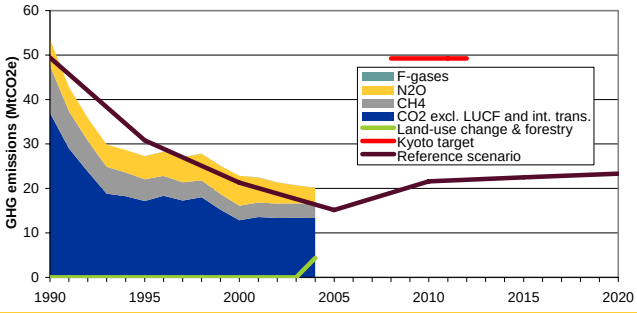


	Share in 2004
Biomass/waste	7.1%
Solar/wind/other	0.3%
Geothermal	0.0%
Hydro	0.3%
Nuclear	42.7%
Gas	24.9%
Oil	22.8%
Coal	2.0%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_20	F-gas
$0	$MtCO_2eq$					
	% gas					
	& tot.GHG					
$30	$MtCO_2eq$					
	% gas					
	& tot.GHG					

Historic and projected GHG emissions



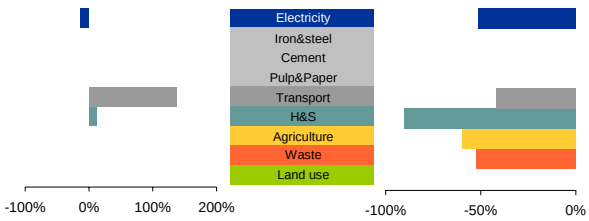
	Share in 2004
F-Gases	0%
N_2O	18%
CH_4	16%
CO_2 excluding LUCF	66%

Kyoto target (KT)	-8.0%
Current CO_2 (90-04)	-63.9%
Current non-CO_2 (90/95-04)	-58.5%
Current total GHGs (90/95-04)	-62.3%
Difference with KT	-54.3%

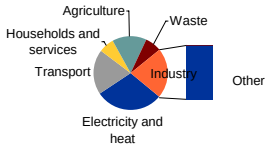
Sectoral indicators

			2004		90-04	Meter
Electricity						
Emissions intensity	0.121	$kgCO_2$ per kWh				
Share of ren. energy (RES)	8%				▲	
Incr. of RE over 1990-2004	5%					
Access to electricity	100%					
Industry						
Emissions per t steel		tCO_2 per t steel				
Emissions per t cement		tCO_2 per t cement				
Emissions per t pulp&paper		tCO_2 per t pulp&paper				
Transport						
Emissions per capita	1.15	$tCO_2eq.$			▼	
Household & services						
Emissions per capita	0.39	$tCO_2eq.$			▼	
Agriculture						
Emissions per capita	0.88	$tCO_2eq.$			▼	
Waste						
Emissions per capita	0.42	$tCO_2eq.$			▼	
Land use change						
Emissions per capita	1.27	$tCO_2eq.$				
International aviation and shipping						
Emissions per capita	0.14	$tCO_2eq.$			▲	

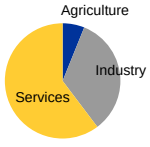
Change in production 1990 to 2004 Change in emissions



Emissions per sector 2004



GDP per sector 2004



Energy investment

Total energy research and development 2004	mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	°/oo	Share (per year) of total GDP	°/oo

Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, Annex I
National GHG targets	
Energy related targets	Renewable Electricity Directive provides a target of 7% of electricity consumption from renewable sources by 2010 12% of TPES to be produced by RES by 2010 35% of electricity to be generated by CHP by 2020 5.75% biofuels in road fuels by 2010 and 15% by 2020
General climate policies	National Energy Strategy (2002), National Climate Change Committee. National sustainable development strategy (2003)
Electricity	National Energy Efficiency Programme (2001). Promotion of renewables. Feed in tariffs for hydro, wind and biomass. Decommissioning of the Ignalina nuclear Increase excise duty on fossil fuels (except gas) by 2004, coke and coal exempt until 2007, electricity until 2010 and orimulsion until 2016.
Industry	Energy efficiency programme. Promotion of clean manufacturing practice.
Transport	Tax exemption on biofuels. Energy efficiency programme.
Households	Housing Strategy 2004 for improved energy efficiency in buildings. Energy Star (labelling program for energy-saving office appliances).
Agriculture	Several policies in place on manure management, crop rotation, target of 3% increase in forest area by 2021. State Programme on reduction of water pollution from agricultural sources.
Waste	State Strategic Waste Plan (2002). The whole sector is undergoing re-organisation to comply with EU directives following the recent accession in 2004.
CDM, JI and IET	AJI projects and GEF considered.

Summary

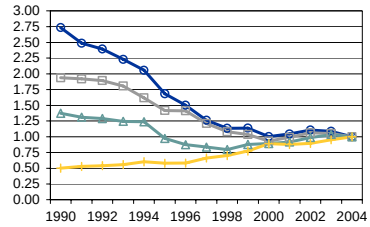
Economy: since the independence of Russia in 1990 the economy has been fluctuating to adjust to the new status. It has become more stable after 2000.
Emissions: emissions have sharply decreased in the mid 90s and have slowly decreased ever since in all sectors.
Fuels: decrease in oil consumption since the independence due to switch to nuclear. Heavy fluctuations in primary energy supply due to due to varying levels of electricity exports. In 2004 one nuclear reactor has been closed and the second reactor will close in 2009. There are plans to build a new reactor at Ignalina.
Policy: promotion of renewable energy and energy efficiency, part of the EU ETS. JI projects considered.

Climate fact sheet — Luxembourg

Economy-wide indicators

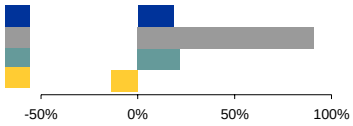
Factors driving emissions (population, GDP, energy and GHG)

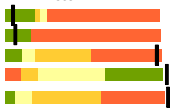
Trends



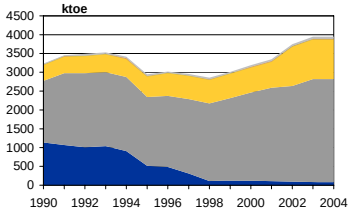
	2004		90-04	Meter
Population	450	ths people		
GDP (PPP)	29	bln US$ (2000)		
Prm. Energy Sply.(TPES)	3,944	ktoe		
GHG emissions	11	$MtCO_2eq.$		
GHG emissions/GDP PPP	0.381	$kgCO_2eq./US$	▼	
TPES/GDP PPP	135	toe/MUS$	▼	
GHG emissions/cap	24.7	$tCO_2eq./cap$	▼	
GDP PPP/cap	64.8	ths US$/cap	▲	
Cum. GHG 1900 to 2004	17.6	$tCO_2eq./cap/y$	▼	

Change from 1990 to 2004





Primary energy supply

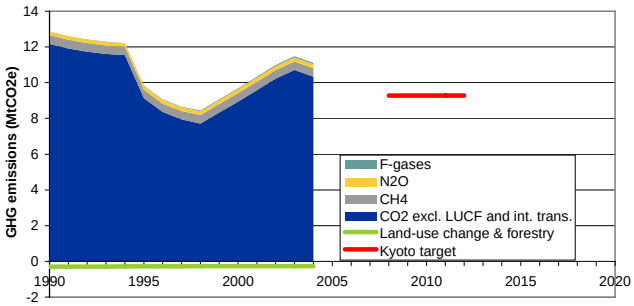


	Share in 2004
Biomass/waste	1.3%
Solar/wind/other	0.1%
Geothermal	
Hydro	0.2%
Nuclear	
Gas	27.0%
Oil	69.5%
Coal	2.0%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_20	F-gas
$0	$MtCO_2eq$					
	% gas					
	& tot.GHG					
$30	$MtCO_2eq$					
	% gas					
	& tot.GHG					

Historic and projected GHG emissions

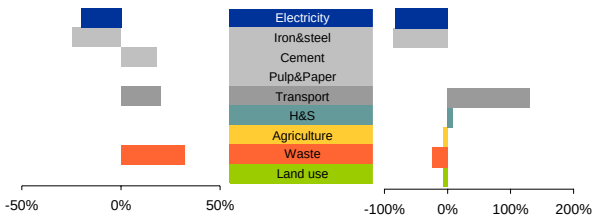


	Share in 2004
F-Gases	1%
N_2O	2%
CH_4	4%
CO_2 excluding LUCF	93%
Kyoto target (KT)	-28.0%
Current CO_2 (90-04)	-15.0%
Current non-CO_2 (90/95-04)	6.7%
Current total GHGs (90/95-04)	-13.8%
Difference with KT	14.2%

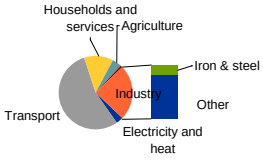
Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity	0.325	$kgCO_2$ per kWh	▼	
Share of ren. energy (RES)	2%		▲	
Incr. of RE over 1990-2004	1%			
Access to electricity	100%			
Industry				
Energy efficiency index	3.6			
Emissions per t steel	0.2	tCO_2 per t steel		
Emissions per t cement		tCO_2 per t cement		
Emissions per t pulp&paper		tCO_2 per t pulp&paper		
Transport				
Emissions per capita	13.52	$tCO_2eq.$	▲	
Household & services				
Emissions per capita	3.12	$tCO_2eq.$	▼	
Agriculture				
Emissions per capita	1.08	$tCO_2eq.$	▼	
Waste				
Emissions per capita	0.18	$tCO_2eq.$	▼	
Land use change				
Emissions per capita	-0.61	$tCO_2eq.$	▼	
International aviation and shipping				
Emissions per capita	2.64	$tCO_2eq.$	▲	

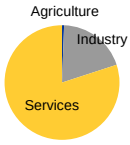
Change in production — **1990 to 2004** — **Change in emissions**



Emissions per sector 2004

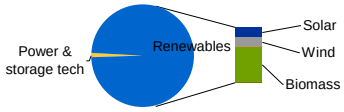


GDP per sector 2004



Energy investment

Total energy research and development 2004	0.0 mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	0.02 °/₀₀	Share (per year) of total GDP	°/₀₀



Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, Annex I
National GHG targets	
Energy related targets	Renewable Electricity Directive provides a target of 5.7% of electricity consumption from renewable sources by 2010 Biofuels Directive provides indicative target of 5.75% share of biofuels in transport fuel by 2010 for each member state
General climate policies	Environmental Protection Fund. Several environmental regulations but no coordinated climate change policy.
Electricity	Promotion of CHP, cogeneration, and gas combined cycle plants. Promotion of renewables (wind). CO2 tax.
Industry	Regulation on air pollution. GHG emissions reduction plan. Voluntary agreements with a 10% reduction target by 2000 compared to 1990. Energy efficiency plan for the steel sector.
Transport	Promotion of public transport and freight transport on rail.
Households	Promotion of cogeneration in public buildings. Special tariffs for energy from cogeneration installations.
Agriculture	Promotion of organic farming and agriculture. Law on forest protection.
Waste	Waste management plan. 3 new composting plants. CH4 from landfills not used for energy at the moment.
CDM, JI and IET	AIJ considered in relation to solar projects. Feasibility studies completed, awaiting government decision.

Summary

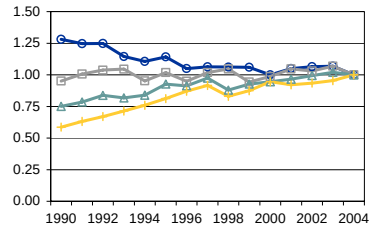
Economy: healthy economy steadily growing.
Emissions: The industrial sector, dominated by the steel industry, was responsible for over 60% of CO2 emissions in 1990 but emissions have comparatively decreased since but not enough to meet the target unless some additional measures are introduced.
Fuels: switch from coal to gas and increasing oil consumption.
Policy: GHG reduction policies in place for the steel industry and various others on energy efficiency and renewables. No coordinated climate change. AIJ for solar projects are being considered.

Climate fact sheet — Malaysia

Economy-wide indicators

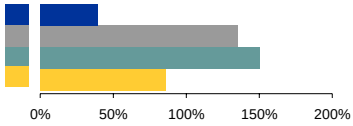
Factors driving emissions (population, GDP, energy and GHG)

Trends



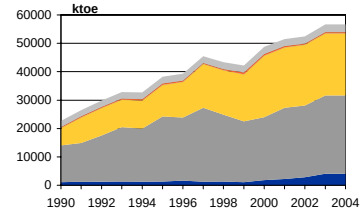
	2004	
Population	24,890	ths people
GDP (PPP)	235	bln US$ (2000)
Prm. Energy Sply.(TPES)	56,655	ktoe
GHG emissions	154	$MtCO_2eq.$
GHG emissions/GDP PPP	0.654	$kgCO_2eq./US$
TPES/GDP PPP	241	toe/MUS$
GHG emissions/cap	6.2	$tCO_2eq./cap$
GDP PPP/cap	9.4	ths US$/cap
Cum. GHG 1900 to 2004	1.5	$tCO_2eq./cap/y$

Change from 1990 to 2004



	90-04	Meter
GHG emissions/GDP PPP	▼	
TPES/GDP PPP	▲	
GHG emissions/cap	▲	
GDP PPP/cap	▲	
Cum. GHG 1900 to 2004	▲	

Primary energy supply

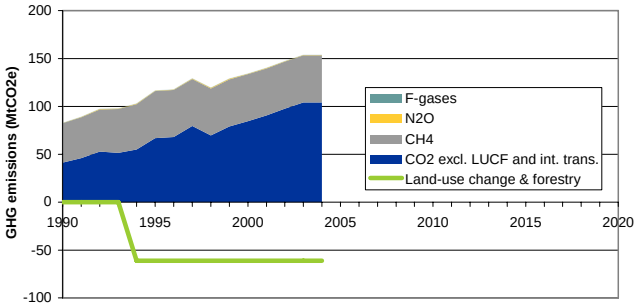


	Share in 2004
Biomass/waste	4.6%
Solar/wind/other	
Geothermal	
Hydro	0.9%
Nuclear	
Gas	38.6%
Oil	48.7%
Coal	7.2%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_20	F-gas
$0	$MtCO_2eq$					
	% gas					
	& tot.GHG					
$30	$MtCO_2eq$					
	% gas					
	& tot.GHG					

Historic and projected GHG emissions



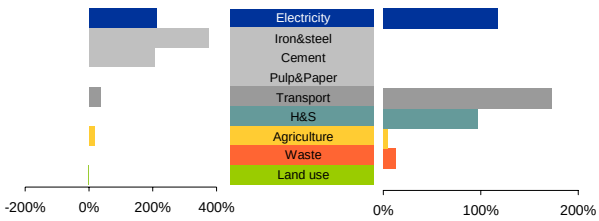
	Share in 2004
F-Gases	0%
N_2O	0%
CH_4	32%
CO_2 excluding LUCF	68%

Current CO_2 (90-04)	152.2%
Current non-CO_2 (90/95-04)	19.7%
Current total GHGs (90/95-04)	85.8%

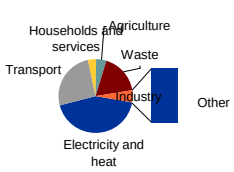
Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity	0.492	$kgCO_2$ per kWh	▼	
Share of ren. energy (RES)	5%		▼	
Incr. of RE over 1990-2004	-5%			
Access to electricity	97%			
Industry				
Energy efficiency index	1.2			
Emissions per t steel	0.0	tCO_2 per t steel		
Emissions per t cement		tCO_2 per t cement		
Emissions per t pulp&paper	0.0	tCO_2 per t pulp&paper		
Transport				
Emissions per capita	1.59	$tCO_2eq.$	▲	
Household & services				
Emissions per capita	0.22	$tCO_2eq.$	▲	
Agriculture				
Emissions per capita	0.28	$tCO_2eq.$	▼	
Waste				
Emissions per capita	1.10	$tCO_2eq.$	▼	
Land use change				
Emissions per capita	-2.45	$tCO_2eq.$		
International aviation and shipping				
Emissions per capita	0.26	$tCO_2eq.$	▲	

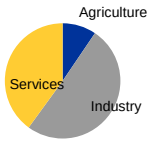
Change in production — **1990 to 2004** — **Change in emissions**



Emissions per sector 2004



GDP per sector 2004



Energy investment

Total energy research and development 2004	mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	°/₀₀	Share (per year) of total GDP	°/₀₀

Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, G77 & China
National GHG targets	
Energy related targets	
General climate policies	Current focus on institutional capacity building, awareness raising, emissions data collection, and research into both technologies and policies.
Electricity	Considering use of solar PV as extension to Rural electrification programme. Development of demand side management programme.
Industry	Considering energy rating schemes, benchmarks and targets for industry to stimulate energy efficiency improvement.
Transport	Research into energy demand and supply balance in the sector required to help policy formulation. Limited scope for fuel substitution away from petroleum but potential for increased efficiency. Investment into light rail systems.
Households	Provision of climate change training for journalists to enable public awareness raising.
Agriculture	Studies into impact of afforestation / reforestation required.
Waste	Large volume of biomass waste, high potential for energy from waste. Currently research into grid-connected biomass CHP.
CDM, JI and IET	

Summary

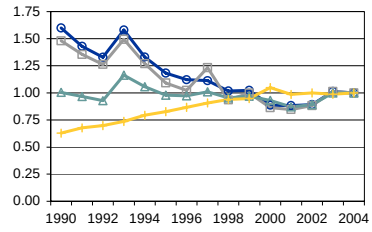
Economy: fast growing economy
Emissions: low GHG emission levels in general but high for the region. High emission intensity in power generation due to dependence on gas.
Fuel: heavily dependent on gas and increase in coal use in the last 5 years.
Policy: Current focus on institutional capacity building, awareness raising, emissions data collection, and research into both technologies and policies. Considering benchmarks to stimulate energy efficiency. Promotion of PV for small rural areas.

Climate fact sheet — Malta

Economy-wide indicators

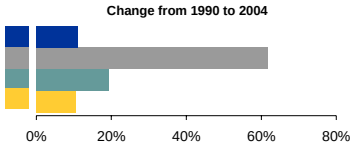
Factors driving emissions (population, GDP, energy and GHG)

Trends

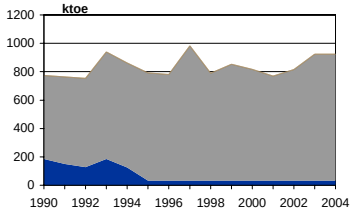


	2004		90-04	Meter
Population	400	ths people		
GDP (PPP)	7	bln US$ (2000)		
Prm. Energy Sply.(TPES)	924	ktoe		
GHG emissions	3	$MtCO_2eq.$		
GHG emissions/GDP PPP	0.392	$kgCO_2eq./US\$$	▼	
TPES/GDP PPP	133	toe/MUS$	▼	
GHG emissions/cap	6.8	$tCO_2eq./cap$	▼	
GDP PPP/cap	17.4	ths US$/cap	▲	
Cum. GHG 1900 to 2004	3.1	$tCO_2eq./cap/y$	▲	

Change from 1990 to 2004



Primary energy supply

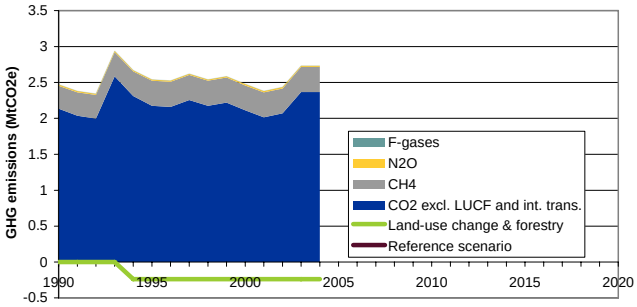


	Share in 2004
Biomass/waste	
Solar/wind/other	
Geothermal	
Hydro	
Nuclear	
Gas	
Oil	96.5%
Coal	3.5%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_2O	F-gas
$0	$MtCO_2eq$					
	% gas					
	& tot.GHG					
$30	$MtCO_2eq$					
	% gas					
	& tot.GHG					

Historic and projected GHG emissions



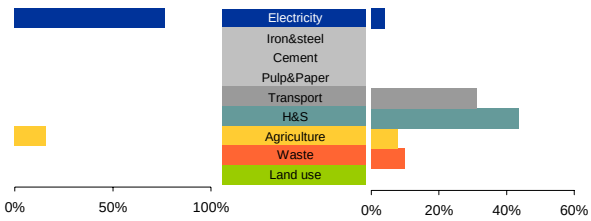
	Share in 2004
F-Gases	0%
N_2O	1%
CH_4	13%
CO_2 excluding LUCF	87%

Current CO_2 (90-04)	10.9%
Current non-CO_2 (90/95-04)	8.8%
Current total GHGs (90/95-04)	10.6%

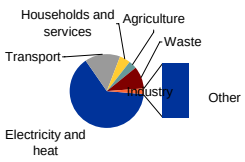
Sectoral indicators

			2004	90-04	Meter
Electricity					
Emissions intensity	0.814	$kgCO_2$ per kWh		▼	
Share of ren. energy (RES) Incr. of RE over 1990-2004					
Access to electricity	100%				
Industry					
Emissions per t steel		tCO_2 per t steel			
Emissions per t cement		tCO_2 per t cement			
Emissions per t pulp&paper		tCO_2 per t pulp&paper			
Transport					
Emissions per capita	1.06	$tCO_2eq.$		▲	
Household & services					
Emissions per capita	0.33	$tCO_2eq.$		▲	
Agriculture					
Emissions per capita	0.24	$tCO_2eq.$		▼	
Waste					
Emissions per capita	0.65	$tCO_2eq.$		▼	
Land use change					
Emissions per capita	-0.60	$tCO_2eq.$			
International aviation and shipping					
Emissions per capita	1.94	$tCO_2eq.$		▼	

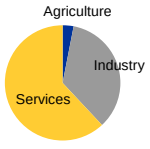
Change in production — **1990 to 2004** — **Change in emissions**



Emissions per sector 2004



GDP per sector 2004



Energy investment

Total energy research and development 2004	mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	°/₀₀	Share (per year) of total GDP	°/₀₀

Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, G77 & China, AOSIS
National GHG targets	No Kyoto target
Energy related targets	Renewable Electricity Directive provides a target of 5% of electricity consumption from renewable sources by 2010 Biofuels Directive provides indicative target of 5.75% share of biofuels in transport fuel by 2010 for each member state
General climate policies	National Action Plan (2000)
Electricity	Energy Efficiency Plan. Introduction of CHP. Switch to gas.
Industry	Industrial CHP incentive scheme could be introduced in the future. Promotion of energy efficiency. Voluntary agreements could be used.
Transport	Promotion of hybrid cars and alternative fuels (hydrogen, LPG and biofuels). Promotion of public transport.
Households	Code of good agricultural practices. Fertilisers management programme.
Agriculture	No particular policies except promotion of efficient air conditioning
Waste	Promotion of aerobic waste treatment. Reduction of water waste. Increase recycling.
CDM, JI and IET	CDM projects considered

Summary

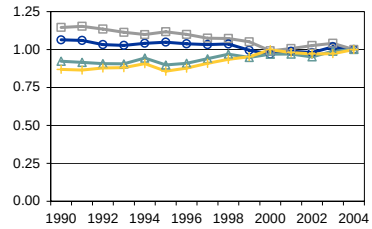
Emissions: increase in emissions in all sectors especially in the households&service and transport sector.
Fuels: mainly dependent on oil at the moment.
Policy: no apparent climate change policy in place. Many measures proposed but apparently none implemented.

Climate fact sheet — Mexico

Economy-wide indicators

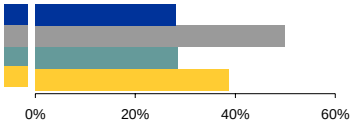
Factors driving emissions (population, GDP, energy and GHG)

Trends

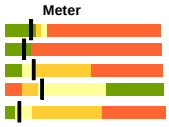


	2004	
Population	104,000	ths people
GDP (PPP)	935	bln US$ (2000)
Prm. Energy Sply.(TPES)	160,010	ktoe
GHG emissions	520	$MtCO_2eq.$
GHG emissions/GDP PPP	0.556	$kgCO_2eq./US$
TPES/GDP PPP	171	toe/MUS$
GHG emissions/cap	5.0	$tCO_2eq./cap$
GDP PPP/cap	9.0	ths US$/cap
Cum. GHG 1900 to 2004	1.3	$tCO_2eq./cap/y$

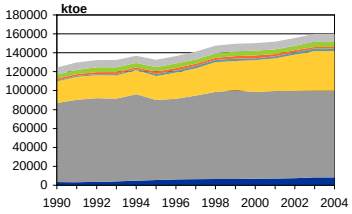
Change from 1990 to 2004



	90-04	Meter
GHG emissions/GDP PPP	▼	
TPES/GDP PPP	▼	
GHG emissions/cap	▲	
GDP PPP/cap	▲	
Cum. GHG 1900 to 2004	▲	



Primary energy supply

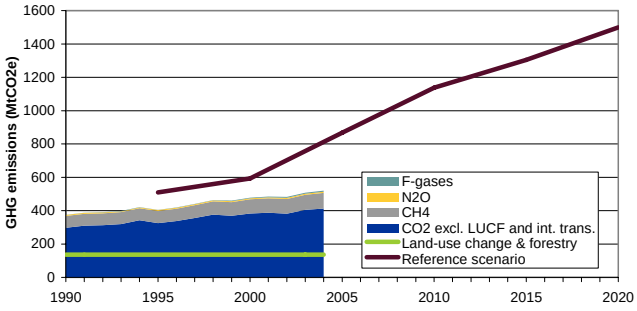


	Share in 2004
Biomass/waste	5.1%
Solar/wind/other	0.0%
Geothermal	3.4%
Hydro	1.1%
Nuclear	1.7%
Gas	26.2%
Oil	57.3%
Coal	5.1%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_2O	F-gas
$0	$MtCO_2eq$			19	2	2
	% gas			6%	5%	11%
	& tot.GHG			1%	0%	0%
$30	$MtCO_2eq$			92	5	8
	% gas			30%	14%	46%
	& tot.GHG			6%	0%	1%

Historic and projected GHG emissions



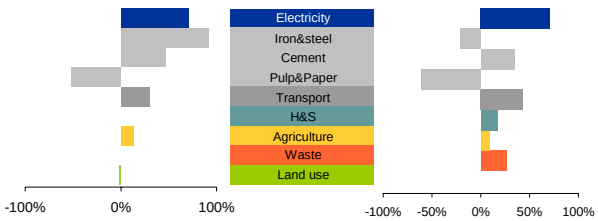
	Share in 2004
F-Gases	1%
N_2O	1%
CH_4	18%
CO_2 excluding LUCF	79%

Current CO_2 (90-04)	38.9%
Current non-CO_2 (90/95-04)	37.5%
Current total GHGs (90/95-04)	38.6%

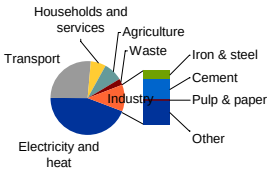
Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity	0.576	$kgCO_2$ per kWh	▲	
Share of ren. energy (RES)	10%		▼	
Incr. of RE over 1990-2004	-1%			
Access to electricity	95%			
Industry				
Energy efficiency index	1.7			
Emissions per t steel	0.6	tCO_2 per t steel		
Emissions per t cement	0.6	tCO_2 per t cement		
Emissions per t pulp&paper	3.5	tCO_2 per t pulp&paper		
Transport				
Emissions per capita	1.32	$tCO_2eq.$	▲	
Household & services				
Emissions per capita	0.33	$tCO_2eq.$	▼	
Agriculture				
Emissions per capita	0.41	$tCO_2eq.$	▼	
Waste				
Emissions per capita	0.15	$tCO_2eq.$	▼	
Land use change				
Emissions per capita	1.31	$tCO_2eq.$	▼	
International aviation and shipping				
Emissions per capita	0.10	$tCO_2eq.$	▲	

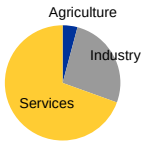
Change in production — **1990 to 2004** — **Change in emissions**



Emissions per sector 2004



GDP per sector 2004



Energy investment

Total energy research and development 2004	mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	°/₀₀	Share (per year) of total GDP	°/₀₀

Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, Gleneagles dialogue
National GHG targets	
Energy related targets	At least 8% renewable energy generation in 2012 (under development).
General climate policies	National Plan of Environment and National Resources. Legal initiative (LAFRE) to provide incentives for renewable energy under development.
Electricity	Programme to reduce leakages of gas.
Industry	Programme for energy saving and fuel switch of the National Mexican Petroleum Company (PEMEX). Development of integrated system of industrial regulation and management (SIRG) as well as registration of emissions and pollution transfer (RETC).
Transport	Pilot project for the use of hybrid buses in public transport. Programmes to improve air quality in metropolitan areas.
Households	Programme for sustainable use of energy. Programme for energy efficiency in buildings and solar water heating.
Agriculture	Policies to reduce deforestation.
Waste	Programmes to use industrial waste for energy generation.
CDM, JI and IET	Important host country for CDM projects (21 registered), good developed CDM infrastructure.

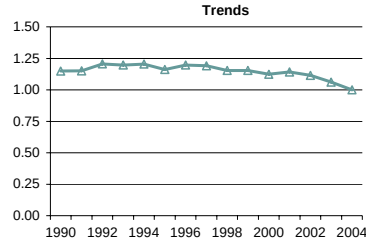
Summary

Economy: Recent signs of increasing growth. Oil is an important contributor to the economy.
Emissions: Increasing total emissions due to population growth and increasing per capita consumption. Medium emissions per capita, medium emissions per GDP. High emission intensity for electricity generation with a strong dependence on oil. Substantial emissions from land-use change
Fuels: Gas dominates the primary energy supply, with oil, coal and biomass each contributing about 10%.
Policy: First efforts to slow down emission growth. Efforts to increase use of renewables. Many CDM activities, good CDM infrastructure. Different emission reduction policies in several sectors

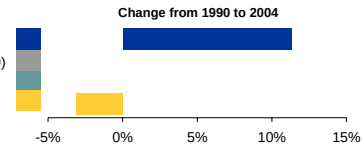
Climate fact sheet — Monaco

Economy-wide indicators

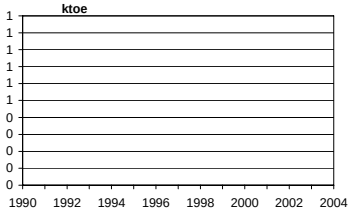
Factors driving emissions (population, GDP, energy and GHG)



	2004		90-04	Meter
Population	33	ths people		
GDP (PPP)		bln US$ (2000)		
Prm. Energy Sply.(TPES)		ktoe		
GHG emissions	0.104	$MtCO_2eq.$		
GHG emissions/GDP PPP		$kgCO_2eq./US$		
TPES/GDP PPP		toe/MUS$		
GHG emissions/cap	3.1	$tCO_2eq./cap$		
GDP PPP/cap		ths US$/cap		
Cum. GHG 1900 to 2004	2.1	$tCO_2eq./cap/y$		



Primary energy supply



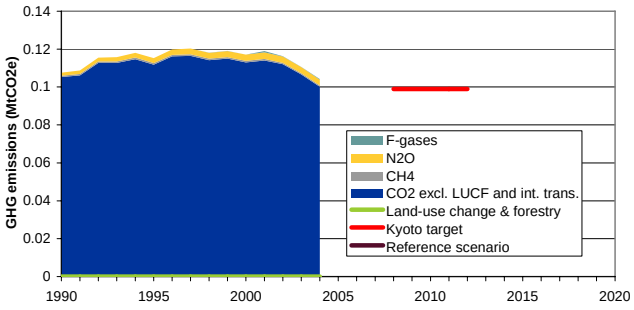
Share in 2004

- Biomass/waste
- Solar/wind/other
- Geothermal
- Hydro
- Nuclear
- Gas
- Oil
- Coal

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_2O	F-gas
$0	$MtCO_2eq$					
	% gas					
	& tot.GHG					
$30	$MtCO_2eq$					
	% gas					
	& tot.GHG					

Historic and projected GHG emissions

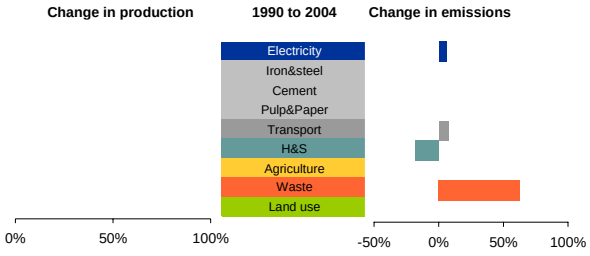


	Share in 2004
F-Gases	0%
N_2O	3%
CH_4	1%
CO_2 excluding LUCF	96%

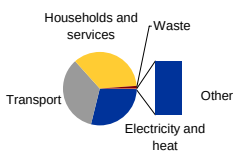
Kyoto target (KT)	-8.0%
Current CO_2 (90-04)	-4.9%
Current non-CO_2 (90/95-04)	75.3%
Current total GHGs (90/95-04)	-3.1%
Difference with KT	4.9%

Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity		$kgCO_2$ per kWh		
Share of ren. energy (RES)				
Incr. of RE over 1990-2004				
Access to electricity	100%			
Industry				
Emissions per t steel		tCO_2 per t steel		
Emissions per t cement		tCO_2 per t cement		
Emissions per t pulp&paper		tCO_2 per t pulp&paper		
Transport				
Emissions per capita	1.07	$tCO_2eq.$	▼	
Household & services				
Emissions per capita	1.11	$tCO_2eq.$	▼	
Agriculture				
Emissions per capita		$tCO_2eq.$		
Waste				
Emissions per capita	0.03	$tCO_2eq.$	▲	
Land use change				
Emissions per capita		$tCO_2eq.$		
International aviation and shipping				
Emissions per capita	0.47	$tCO_2eq.$	▲	



Emissions per sector 2004



GDP per sector 2004

Energy investment

Total energy research and development 2004	mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	°/₀₀	Share (per year) of total GDP	°/₀₀

Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, Annex I
National GHG targets	
Energy related targets	
General climate policies	
Electricity	Monaco is associated with the French Alpes Côte d'Azur province for its energy supply and development of renewables. Eco-energy plan for energy efficiency.
Industry	-
Transport	Transport management programme. Promotion of electric vehicles. Mandatory check every 4ys for cars, every year for heavy duty vehicles, and every 6 months for buses.
Households	Auditing programme for public buildings to identify efficiency improvements.
Agriculture	No agricultural land.
Waste	Recycling programme.
CDM, JI and IET	

Summary

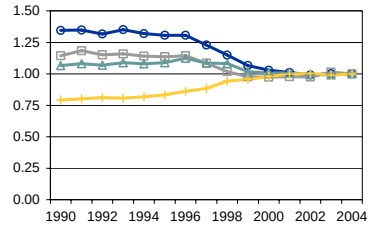
Emissions: mainly attributable to the domestic and the transport sector. Strong increase in emissions from waste from 1990. Energy is imported from France and therefore no emissions are due to energy production.
Policy: mainly linked to the Alpes Côte d'Azur province. Especially focused on transport management and traffic control. Major auditing programme underway to identify potential energy improvements.

Climate fact sheet — Netherlands

Economy-wide indicators

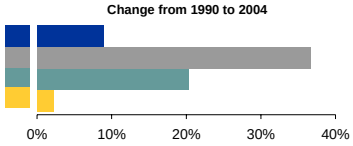
Factors driving emissions (population, GDP, energy and GHG)

Trends

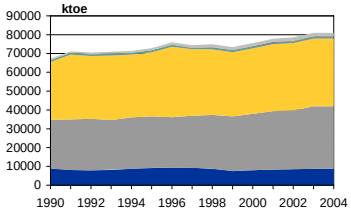


	2004		90-04	Meter
Population	16,490	ths people		
GDP (PPP)	476	bln US$ (2000)		
Prm. Energy Sply.(TPES)	81,014	ktoe		
GHG emissions	218	$MtCO_2eq.$		
GHG emissions/GDP PPP	0.458	$kgCO_2eq./US\$$	▼	
TPES/GDP PPP	170	toe/MUS$	▼	
GHG emissions/cap	13.2	$tCO_2eq./cap$	▼	
GDP PPP/cap	28.8	ths US$/cap	▲	
Cum. GHG 1900 to 2004	7.6	$tCO_2eq./cap/y$	▲	

Change from 1990 to 2004



Primary energy supply

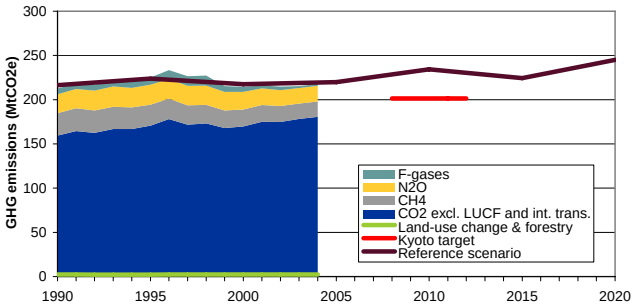


	Share in 2004
Biomass/waste	2.3%
Solar/wind/other	0.2%
Geothermal	
Hydro	0.0%
Nuclear	1.3%
Gas	44.4%
Oil	40.9%
Coal	10.8%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_20	F-gas
$0	$MtCO_2eq$					
	% gas					
	& tot.GHG					
$30	$MtCO_2eq$	24	24			
	% gas	11%	11%			
	& tot.GHG	10%	10%			

Historic and projected GHG emissions



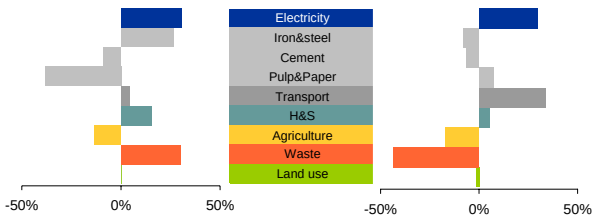
	Share in 2004
F-Gases	1%
N_2O	8%
CH_4	8%
CO_2 excluding LUCF	83%

Kyoto target (KT)	-6.0%
Current CO_2 (90-04)	13.4%
Current non-CO_2 (90/95-04)	-32.4%
Current total GHGs (90/95-04)	1.6%
Difference with KT	7.6%

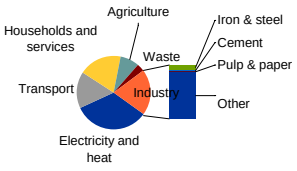
Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity	0.440	$kgCO_2$ per kWh	▼	
Share of ren. energy (RES)	3%		▲	
Incr. of RE over 1990-2004	1%			
Access to electricity	100%			
Industry				
Energy efficiency index	1.5			
Emissions per t steel	0.6	tCO_2 per t steel		
Emissions per t cement	0.3	tCO_2 per t cement		
Emissions per t pulp&paper	8.8	tCO_2 per t pulp&paper		
Transport				
Emissions per capita	2.15	$tCO_2eq.$	▲	
Household & services				
Emissions per capita	2.49	$tCO_2eq.$	▼	
Agriculture				
Emissions per capita	1.11	$tCO_2eq.$	▼	
Waste				
Emissions per capita	0.44	$tCO_2eq.$	▼	
Land use change				
Emissions per capita	0.14	$tCO_2eq.$	▼	
International aviation and shipping				
Emissions per capita	3.49	$tCO_2eq.$	▲	

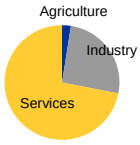
Change in production — **1990 to 2004** — **Change in emissions**



Emissions per sector 2004

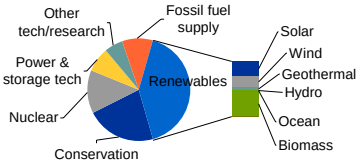


GDP per sector 2004



Energy investment

Total energy research and development 2004	12.1 mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	0.32 °/₀₀	Share (per year) of total GDP	°/₀₀



Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, Annex I
National GHG targets	
Energy related targets	1500 MW wind onshore by 2010, 6000 MW in 2020 Renewable Electricity Directive provides a target of 9% of electricity consumption from renewable sources by 2010 Biofuels Directive provides indicative target of 5.75% share of biofuels in transport fuel by 2010 for each member state
General climate policies	National Climate Policy Implementation Plan. Energy tax based on the energy content of fuels and their carbon content. Part of the EU ETS. Other Covenant on climate policy between the national Government and the local authorities (provinces and municipalities).
Electricity	EU ETS. Fiscal incentives for the development of gas-fired CHPs. Subsidies, fiscal incentives, “green certificates”, “green label” trading system; support to R&D for renewables.
Industry	EU ETS. Benchmarking covenants in place. Long-term agreements with industries on GHG reduction programmes.
Transport	2% target for Biofuels Directive. Excise duties. Energy labelling for new cars. Voluntary agreements with airlines and the Schiphol Airport.
Households	Voluntary agreements with housing corporations. Energy tax and energy efficient appliances.
Agriculture	Glami Covenant: 65% energy efficiency increase by 2010; Common Agricultural Policy of the EC. Livestock reduction: milk quotas.
Waste	Landfill policy aiming to reduce CH4 emissions.
CDM, JI and IET	Proactive in the early development of CDM and JI methods. Use of JI and CDM is planned. Bilateral/multilateral long-term cooperation programmes with 22 developing countries. Miliev programme to support private sector initiatives. Participation in the FINESSE concept for “green” energy supply.

Summary

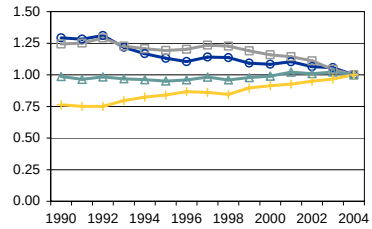
Economy: Until recently the Netherlands had a higher growth rate than the EU average, and over the period 1990-2004 grew by nearly 40%.
Emissions: Emissions per capita are lower than the EU average and both emissions and energy intensities have decreased since 1996. Despite GHG emissions having almost stabilised, the country is unlikely to meet its Kyoto targets with domestic measures.
Fuel: The share of renewables in energy supply is very low and emissions per kWh of electricity are relatively high.
Policy: Ambitious energy efficiency policy with benchmarking covenants and active monitoring and evaluation of policies. More policies and measures needed to curb energy demand in the transport sector.

Climate fact sheet — New Zealand

Economy-wide indicators

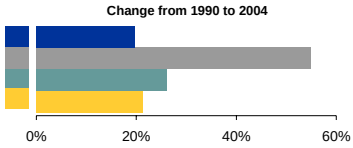
Factors driving emissions (population, GDP, energy and GHG)

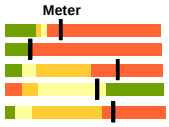
Trends



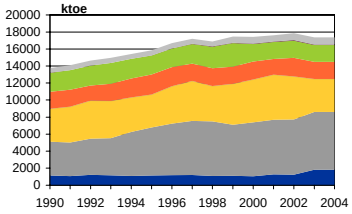
	2004		90-04	Meter
Population	4,080	ths people		
GDP (PPP)	87	bln US$ (2000)		
Prm. Energy Sply.(TPES)	17,372	ktoe		
GHG emissions	75	$MtCO_2eq.$		
GHG emissions/GDP PPP	0.854	$kgCO_2eq./US$	▼	
TPES/GDP PPP	199	toe/MUS$	▼	
GHG emissions/cap	18.3	$tCO_2eq./cap$	▲	
GDP PPP/cap	21.4	ths US$/cap	▲	
Cum. GHG 1900 to 2004	8.6	$tCO_2eq./cap/y$	▼	

Change from 1990 to 2004





Primary energy supply

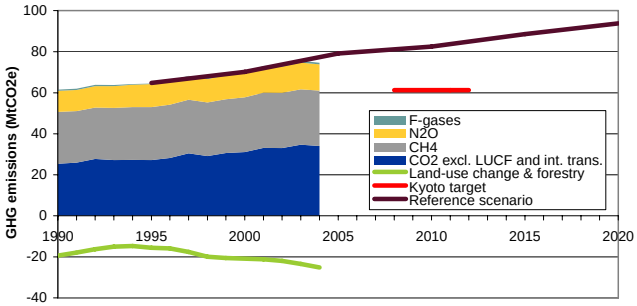


	Share in 2004
Biomass/waste	4.8%
Solar/wind/other	0.4%
Geothermal	11.4%
Hydro	11.7%
Nuclear	
Gas	22.2%
Oil	39.1%
Coal	10.4%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_2O	F-gas
$0	$MtCO_2eq$					
	% gas					
	& tot.GHG					
$30	$MtCO_2eq$					
	% gas					
	& tot.GHG					

Historic and projected GHG emissions

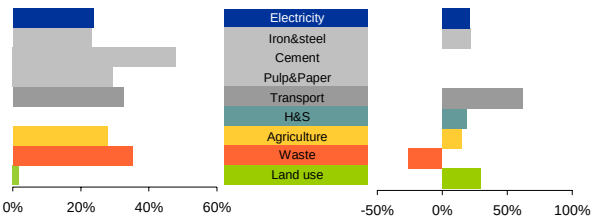


	Share in 2004
F-Gases	1%
N_2O	17%
CH_4	36%
CO_2 excluding LUCF	46%
Kyoto target (KT)	0.0%
Current CO_2 (90-04)	34.2%
Current non-CO_2 (90/95-04)	12.9%
Current total GHGs (90/95-04)	21.7%
Difference with KT	21.7%

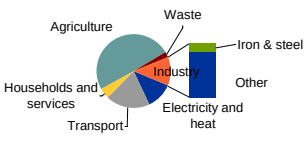
Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity	0.178	$kgCO_2$ per kWh	▲	
Share of ren. energy (RES)	28%		▼	
Incr. of RE over 1990-2004	-6%			
Access to electricity	100%			
Industry				
Energy efficiency index	2.6			
Emissions per t steel	1.8	tCO_2 per t steel		
Emissions per t cement		tCO_2 per t cement		
Emissions per t pulp&paper		tCO_2 per t pulp&paper		
Transport				
Emissions per capita	3.51	$tCO_2eq.$	▲	
Household & services				
Emissions per capita	0.85	$tCO_2eq.$	▼	
Agriculture				
Emissions per capita	9.04	$tCO_2eq.$	▼	
Waste				
Emissions per capita	0.45	$tCO_2eq.$	▼	
Land use change				
Emissions per capita	-6.17	$tCO_2eq.$	▲	
International aviation and shipping				
Emissions per capita	0.82	$tCO_2eq.$	▲	

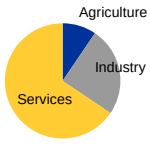
Change in production 1990 to 2004 Change in emissions



Emissions per sector 2004

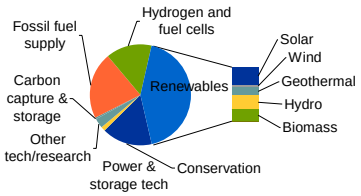


GDP per sector 2004



Energy investment

Total energy research and development 2004	0.4 mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	0.13 °/₀₀	Share (per year) of total GDP	°/₀₀



Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, Annex I
National GHG targets	
Energy related targets	Increasing New Zealand's renewable energy supply to provide a further 30 petajoules of consumer energy by 2012. 20% improvement in energy efficiency by 2012 (equivalent of a continual improvement rate of 2 percent p.a. to 2012)
General climate policies	Preferred Policy Package on Climate Change (PPPCC) (2002). Energy Efficiency and Conservation Act (2000). Projects to Reduce Emissions programme. Domestic emission trading system under consideration. Carbon tax and associated Negotiated Greenhouse Agreements dropped.
Electricity	National Energy Efficiency and Conservation Strategy. Energy supply and renewables programmes: Demand response. Higher contribution of RES in electricity production. Emissions charges (from 2007) under PPPCC.
Industry	Possible emissions trading. "Emprove" programme: grants for energy audits, loans to implement energy savings and promotion of environmental management systems. No loss campaign. SF6 reduction programme. Voluntary agreements considered to replace the proposed Negotiated Greenhouse Agreements.
Transport	New Zealand Transport Strategy (2002). Land Transport Management Act (2004). Vehicle efficiency. Increase share of biofuels.
Households	EnergyWise home grants for energy efficiency and insulation. Interest-free loans for residential RE systems. Minimum energy performance standards and "Energy Star" labelling.
Agriculture	Exemptions against research to reduce CH4 and N2O under PPPCC. R&D programmes.
Waste	Waste Minimization and Management Strategy (2002). Enhance CH4 recovery from landfills.
CDM, JI and IET	Climate Change Projects under PPPCC (2002). Bilateral/multilateral agreements with US and Australia.

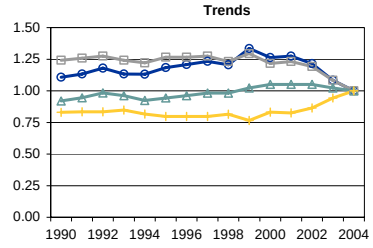
Summary

Economy: Strong growth in GDP.
Emissions: RES dominate electricity production (60%), however emissions are in line with EU countries with significantly lower shares of RES in power generation. Comparatively very high share of CH4 and N2O emissions from agriculture. Per capita transport emissions are high
Fuels: Oil has been increasing in the energy mix at the expense of gas. The contribution from biomass and other renewables has increased since 2000.
Policy: New Government in place since Sept 2005. Some policies have been reviewed. Bilateral climate change partnerships with the US and Australia.

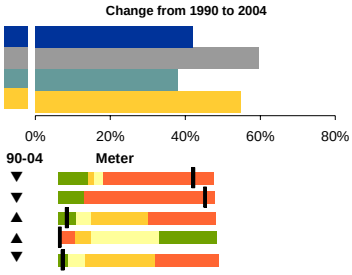
Climate fact sheet — Nigeria

Economy-wide indicators

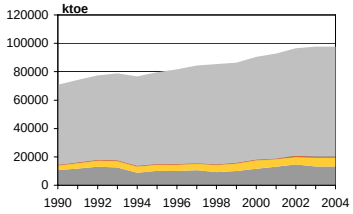
Factors driving emissions (population, GDP, energy and GHG)



	2004		90-04	Meter
Population	128,710	ths people		
GDP (PPP)	137	bln US$ (2000)		
Prm. Energy Sply.(TPES)	97,789	ktoe		
GHG emissions	232	$MtCO_2eq.$		
GHG emissions/GDP PPP	1.698	$kgCO_2eq./US$$	▼	
TPES/GDP PPP	716	toe/MUS$	▼	
GHG emissions/cap	1.8	$tCO_2eq./cap$	▲	
GDP PPP/cap	1.1	ths US$/cap	▲	
Cum. GHG 1900 to 2004	0.5	$tCO_2eq./cap/y$	▼	



Primary energy supply

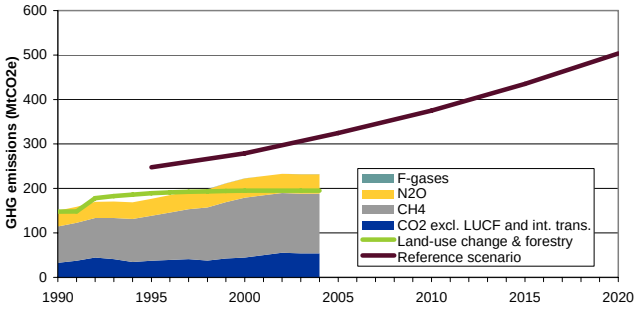


	Share in 2004
Biomass/waste	79.4%
Solar/wind/other	
Geothermal	
Hydro	0.7%
Nuclear	
Gas	6.4%
Oil	13.5%
Coal	0.0%

Emission reduction potential until 2020 below reference scenario

	CO_2 upper	CO_2 lower	CH_4	N_2O	F-gas
$0	$MtCO_2eq$				
	% gas				
	& tot.GHG				
$30	$MtCO_2eq$				
	% gas				
	& tot.GHG				

Historic and projected GHG emissions

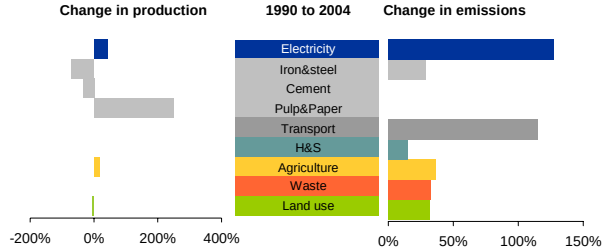


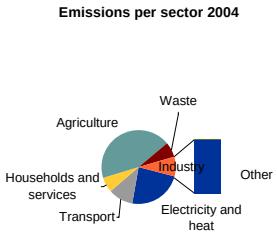
	Share in 2004
F-Gases	0%
N_2O	19%
CH_4	58%
CO_2 excluding LUCF	23%

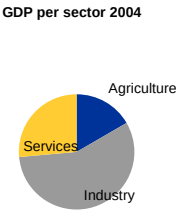
Current CO_2 (90-04)	64.9%
Current non-CO_2 (90/95-04)	51.8%
Current total GHGs (90/95-04)	54.7%

Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity	0.446	$kgCO_2$ per kWh	▲	
Share of ren. energy (RES)	80%		▼	
Incr. of RE over 1990-2004	0%			
Access to electricity	40%			
Industry				
Emissions per t steel	4.5	tCO_2 per t steel		
Emissions per t cement		tCO_2 per t cement		
Emissions per t pulp&paper	0.0	tCO_2 per t pulp&paper		
Transport				
Emissions per capita	0.20	$tCO_2eq.$	▲	
Household & services				
Emissions per capita	0.12	$tCO_2eq.$	▼	
Agriculture				
Emissions per capita	0.79	$tCO_2eq.$	▼	
Waste				
Emissions per capita	0.12	$tCO_2eq.$	▼	
Land use change				
Emissions per capita	1.51	$tCO_2eq.$	▼	
International aviation and shipping				
Emissions per capita	0.03	$tCO_2eq.$	▲	







Energy investment

Total energy research and development 2004	mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	°/₀₀	Share (per year) of total GDP	°/₀₀

Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, Gleneagles dialogue, G77 & China, OPEC
National GHG targets	
Energy related targets	
General climate policies	Government has identified and ranked mitigation options and developed emissions scenarios, but no concrete actions taken.
Electricity	Potential for increased use if natural gas and renewable electricity, in particular solar PV and small hydro.
Industry	Potential for increased flaring of natural gas. Potential for increased energy efficiency.
Transport	Large supply of LNG but not expected to overtake petroleum in near future.
Households	Potential for increased energy efficiency.
Agriculture	(Mechanisation in sector currently low.) Afforestation, agroforestry and forest protection options for carbon sequestration screened by Government.
Waste	
CDM, JI and IET	

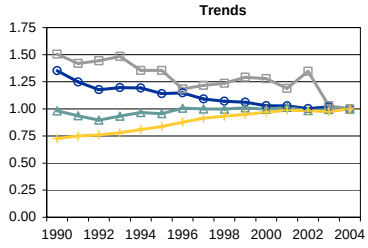
Summary

Economy: Strong growth in population and GDP. Heavy dependence on oil production. One of the lowest GDP per capita, although this is increasing.
Emissions: Lower than average emissions per capita for a non Annex 1 country, linked to a high proportion of biomass in the energy supply.
Fuels: Abundant reserves of fossil fuel, specifically petroleum, natural gas, coal and tar sand. Large potential for renewable energy: solar, hydro, biomass, and wind. Energy and land use change and forestry are the main contributors to carbon emissions.

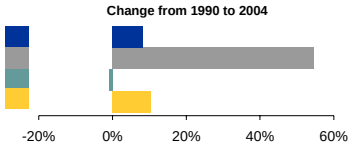
Climate fact sheet — Norway

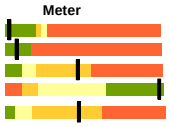
Economy-wide indicators

Factors driving emissions (population, GDP, energy and GHG)

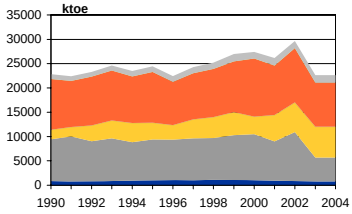


	2004		90-04	Meter
Population	4,590	ths people		
GDP (PPP)	162	bln US$ (2000)		
Prm. Energy Sply.(TPES)	22,664	ktoe		
GHG emissions	55	$MtCO_2eq.$		
GHG emissions/GDP PPP	0.339	$kgCO_2eq./US$	▼	
TPES/GDP PPP	140	toe/MUS$	▼	
GHG emissions/cap	12.0	$tCO_2eq./cap$	▲	
GDP PPP/cap	35.3	ths US$/cap	▲	
Cum. GHG 1900 to 2004	5.9	$tCO_2eq./cap/y$	▲	





Primary energy supply

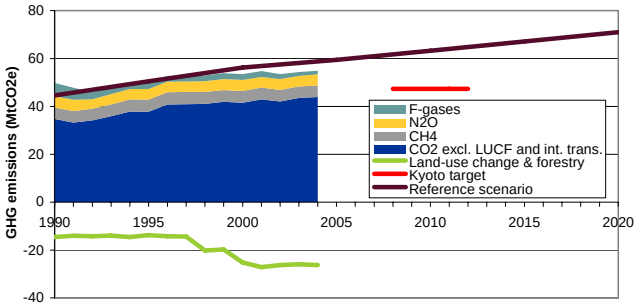


	Share in 2004
Biomass/waste	6.7%
Solar/wind/other	0.1%
Geothermal	
Hydro	40.0%
Nuclear	
Gas	28.1%
Oil	21.5%
Coal	3.5%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_20	F-gas
$0	$MtCO_2eq$					
	% gas					
	& tot.GHG					
$30	$MtCO_2eq$					
	% gas					
	& tot.GHG					

Historic and projected GHG emissions

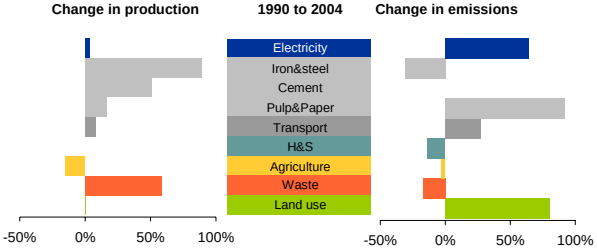


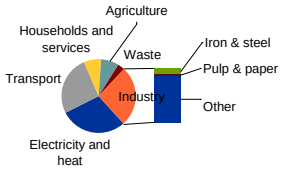
	Share in 2004
F-Gases	3%
N_2O	8%
CH_4	9%
CO_2 excluding LUCF	80%

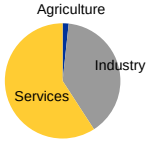
Kyoto target (KT)	1.0%
Current CO_2 (90-04)	26.5%
Current non-CO_2 (90/95-04)	-9.5%
Current total GHGs (90/95-04)	17.2%
Difference with KT	16.2%

Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity	0.009	$kgCO_2$ per kWh	▲	
Share of ren. energy (RES)	47%		▼	
Incr. of RE over 1990-2004	-3%			
Access to electricity	100%			
Industry				
Energy efficiency index	1.6			
Emissions per t steel	2.2	tCO_2 per t steel		
Emissions per t cement		tCO_2 per t cement		
Emissions per t pulp&paper	0.2	tCO_2 per t pulp&paper		
Transport				
Emissions per capita	3.14	$tCO_2eq.$	▲	
Household & services				
Emissions per capita	0.90	$tCO_2eq.$	▼	
Agriculture				
Emissions per capita	0.94	$tCO_2eq.$	▼	
Waste				
Emissions per capita	0.35	$tCO_2eq.$	▼	
Land use change				
Emissions per capita	-5.73	$tCO_2eq.$	▲	
International aviation and shipping				
Emissions per capita	0.60	$tCO_2eq.$	▲	

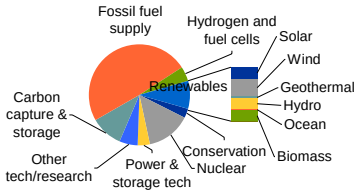






Energy investment

Total energy research and development 2004	3.5 mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	0.33 °/₀₀	Share (per year) of total GDP	°/₀₀



Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, Annex I
National GHG targets	Long term reductions of up to -80% from 1990 levels by 2050.
Energy related targets	Objective to achieve 12 TWh per year in new renewable energy production and energy savings by 2010.
General climate policies	White Paper on National Climate Policy (2001). White Paper on Energy Policy (1999). CO2 tax and tax on electricity consumption. Domestic trading scheme for 2005-07.
Electricity	Link between EU ETS and domestic trading scheme planned, awaiting final approval. Targets for renewable energy and energy saving (2000). Creation of energy agency Enova. CO2 storage.
Industry	Link between EU ETS and domestic trading scheme planned, awaiting final approval. Pollution Control Act. Several voluntary measures and agreements.
Transport	CO2 tax. Tax exemptions for gas and alternative fuels. CO2 labelling for new cars. Support biofuels. Incentives for electric cars.
Households	Standards and labelling for household devices. Financial incentives for new homes with non-electric heating (2002)
Agriculture	Production management.
Waste	Pollution Control Act. Tax on the final disposal of waste. Agreement with industry to minimize waste. Increase waste recycling.
CDM, JI and IET	Agreement on JI projects with several Eastern European countries and Countries from the former Soviet Union. Several CDM projects with Asian and Latin American countries. Participation in the JI Testing Ground Facility of Nordic countries for the Baltic Sea region (2002).

Summary

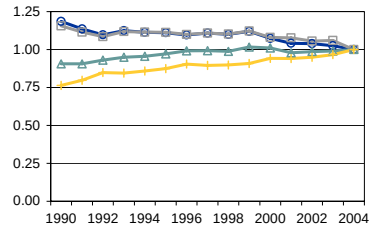
Economy: Strong growth in the economy and relatively stable emissions per capita.
Emissions: Growth in emissions but decoupled to an extent from GDP and energy growth. Projections are above current trends. In the electricity sector emissions are growing significantly faster than production
Fuels: Energy supply is dominated by hydro, gas and oil.
Policy: Despite having a substantial renewable power generation capacity Norway is falling short of its Kyoto target. There is a domestic emissions trading scheme, which is planned to be linked to the EU ETS. There are agreements for JI projects

Climate fact sheet — Pakistan

Economy-wide indicators

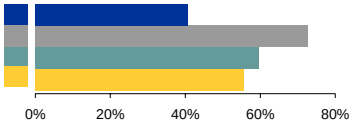
Factors driving emissions (population, GDP, energy and GHG)

Trends

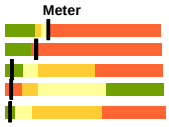


	2004	
Population	152,060	ths people
GDP (PPP)	311	bln US$ (2000)
Prm. Energy Sply.(TPES)	69,309	ktoe
GHG emissions	230	$MtCO_2eq.$
GHG emissions/GDP PPP	0.739	$kgCO_2eq./US$
TPES/GDP PPP	223	toe/MUS$
GHG emissions/cap	1.5	$tCO_2eq./cap$
GDP PPP/cap	2.0	ths US$/cap
Cum. GHG 1900 to 2004	0.6	$tCO_2eq./cap/y$

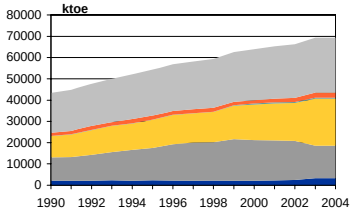
Change from 1990 to 2004



	90-04	Meter
GHG emissions/GDP PPP	▼	
TPES/GDP PPP	▼	
GHG emissions/cap	▲	
GDP PPP/cap	▲	
Cum. GHG 1900 to 2004	▼	



Primary energy supply

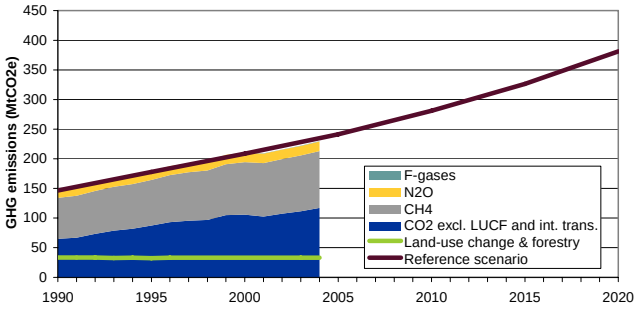


	Share in 2004
Biomass/waste	37.3%
Solar/wind/other	
Geothermal	
Hydro	3.3%
Nuclear	0.7%
Gas	32.0%
Oil	22.0%
Coal	4.8%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_20	F-gas
$0	$MtCO_2eq$					
	% gas					
	& tot.GHG					
$30	$MtCO_2eq$					
	% gas					
	& tot.GHG					

Historic and projected GHG emissions



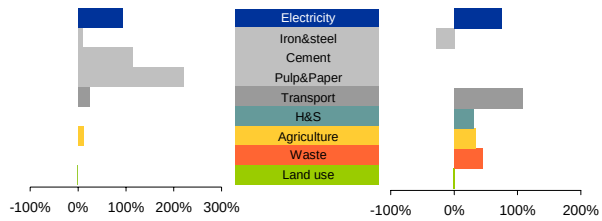
	Share in 2004
F-Gases	0%
N_2O	7%
CH_4	42%
CO_2 excluding LUCF	51%

Current CO_2 (90-04)	80.0%
Current non-CO_2 (90/95-04)	36.3%
Current total GHGs (90/95-04)	55.6%

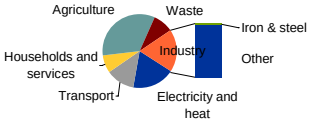
Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity	0.370	$kgCO_2$ per kWh	▼	
Share of ren. energy (RES)	41%		▼	
Incr. of RE over 1990-2004	-6%			
Access to electricity	53%			
Industry				
Energy efficiency index	1.4			
Emissions per t steel	1.3	tCO_2 per t steel		
Emissions per t cement		tCO_2 per t cement		
Emissions per t pulp&paper	0.0	tCO_2 per t pulp&paper		
Transport				
Emissions per capita	0.19	$tCO_2eq.$	▲	
Household & services				
Emissions per capita	0.12	$tCO_2eq.$	▼	
Agriculture				
Emissions per capita	0.51	$tCO_2eq.$	▼	
Waste				
Emissions per capita	0.14	$tCO_2eq.$	▲	
Land use change				
Emissions per capita	0.22	$tCO_2eq.$	▼	
International aviation and shipping				
Emissions per capita	0.02	$tCO_2eq.$	▲	

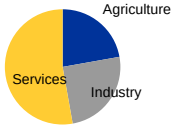
Change in production — **1990 to 2004** — **Change in emissions**



Emissions per sector 2004



GDP per sector 2004



Energy investment

Total energy research and development 2004	mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	°/₀₀	Share (per year) of total GDP	°/₀₀

Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, G77 & China
National GHG targets	
Energy related targets	
General climate policies	Pakistan Environment Protection Act 1997 (PEPA)
Electricity	Promotion for wind energy and switch to gas.
Industry	No policies
Transport	Fuel Efficiency in Road Transport Sector Project funded by GEF.
Households	No policies
Agriculture	National Conservation Strategy (1992). Forestry Sector Master Plan
Waste	No policies
CDM, JI and IET	Establishment of CDM cell in 2005. CDM project development in its infancy.

Summary

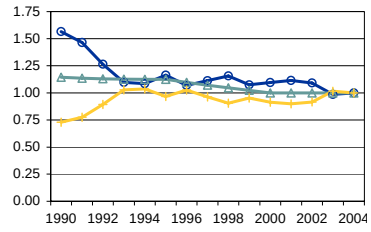
Economy: Both population and GDP has grown significantly over the period.
Emissions: GHG emissions have increased substantially together with economic and population growth. Significant increase in the transport sector, whereas there was a decrease in the Iron&Steel sector. Significant methane emissions compared to other countries.
Fuel: heavily reliant on biomass which has the biggest share of the fuel mix. In the last decade gas has replaced oil.
Policy: limited environmental policies and virtual no climate change policies. Focus on environment is very limited. Very keen in research projects for future policy development.

Climate fact sheet — Papua New Guinea

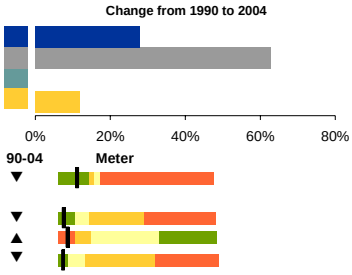
Economy-wide indicators

Factors driving emissions (population, GDP, energy and GHG)

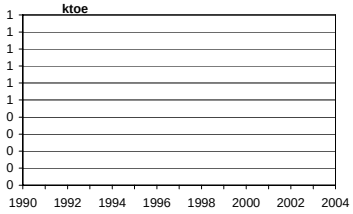
Trends



	2004		Change from 1990 to 2004
Population	4,809	ths people	
GDP (PPP)	13	bln US$ (2000)	
Prm. Energy Sply.(TPES)		ktoe	
GHG emissions	7	$MtCO_2eq.$	
GHG emissions/GDP PPP	0.486	$kgCO_2eq./US$$	
TPES/GDP PPP		toe/MUS$	
GHG emissions/cap	1.4	$tCO_2eq./cap$	
GDP PPP/cap	2.8	ths US$/cap	
Cum. GHG 1900 to 2004	0.6	$tCO_2eq./cap/y$	



Primary energy supply



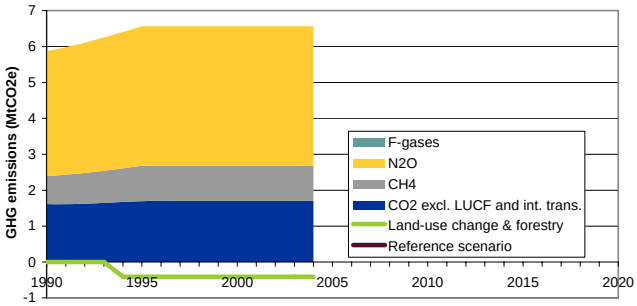
Share in 2004

- Biomass/waste
- Solar/wind/other
- Geothermal
- Hydro
- Nuclear
- Gas
- Oil
- Coal

Emission reduction potential until 2020 below reference scenario

	CO_2 upper	CO_2 lower	CH_4	N_2O	F-gas
$0	$MtCO_2eq$				
	% gas				
	& tot.GHG				
$30	$MtCO_2eq$				
	% gas				
	& tot.GHG				

Historic and projected GHG emissions

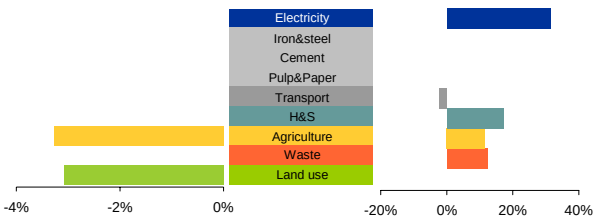


	Share in 2004
F-Gases	0%
N_2O	59%
CH_4	15%
CO_2 excluding LUCF	26%
Current CO_2 (90-04)	5.7%
Current non-CO_2 (90/95-04)	14.1%
Current total GHGs (90/95-04)	11.8%

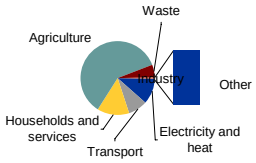
Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity		$kgCO_2$ per kWh		
Share of ren. energy (RES)				
Incr. of RE over 1990-2004				
Access to electricity				
Industry				
Emissions per t steel		tCO_2 per t steel		
Emissions per t cement		tCO_2 per t cement		
Emissions per t pulp&paper		tCO_2 per t pulp&paper		
Transport				
Emissions per capita	0.11	$tCO_2eq.$	▼	
Household & services				
Emissions per capita	0.19	$tCO_2eq.$	▼	
Agriculture				
Emissions per capita	0.82	$tCO_2eq.$	▼	
Waste				
Emissions per capita	0.08	$tCO_2eq.$	▼	
Land use change				
Emissions per capita	-0.09	$tCO_2eq.$		
International aviation and shipping				
Emissions per capita	0.01	$tCO_2eq.$	▲	

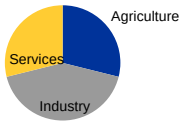
Change in production 1990 to 2004 Change in emissions



Emissions per sector 2004



GDP per sector 2004



Energy investment

Total energy research and development 2004	mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	°/₀₀	Share (per year) of total GDP	°/₀₀

Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, G77 & China, AOSIS
National GHG targets	Initiated a discussion on reducing emissions from deforestation signalling to be willing to take on a target
Energy related targets	
General climate policies	No emissions policies. Outsourcing of conservation initiatives to NGOs and local communities. Deforestation and waste disposal issues are becoming more important. Need for improved policies stated for all sectors.
Electricity	Stated need to promote awareness of and implementation of renewable energies. Need for research into use of biomass, biogas and hydro power for electricity production.
Industry	Stated need to introduce incentives for energy efficiency.
Transport	Stated need to introduce CO2 tax on petroleum and subsidies for public transport.
Households	Need for public awareness raising.
Agriculture	Want to explore afforestation as carbon sequestration option. Community sustainability programmes. Moratorium on new forestry licences.
Waste	Need to raise priority of waste management, improve waste legislation and enforcement and initiate education on recycling, composting and waste reduction.
CDM, JI and IET	-

Summary

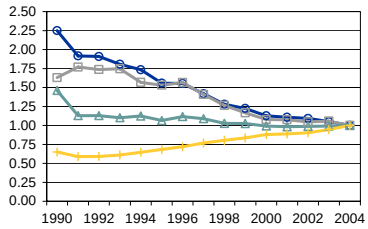
Economy: Both population and GDP has grown significantly over the period. Trends in GDP/cap and GHG/GDP very stable since 1993.
Emissions: Emissions per capita are very low and has been relatively stable. High emissions from deforestation up to 1996, than becoming net sink.
Policy: No mitigation policies but willing to discuss reducing deforestation.

Climate fact sheet — Poland

Economy-wide indicators

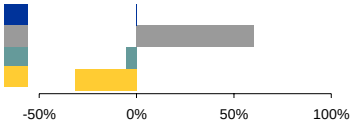
Factors driving emissions (population, GDP, energy and GHG)

Trends



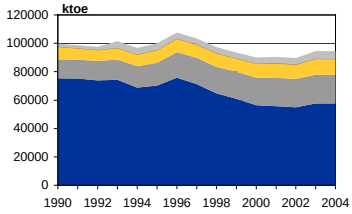
	2004	
Population	38,180	ths people
GDP (PPP)	455	bln US$ (2000)
Prm. Energy Sply.(TPES)	94,540	ktoe
GHG emissions	388	$MtCO_2eq.$
GHG emissions/GDP PPP	0.852	$kgCO_2eq./US$
TPES/GDP PPP	208	toe/MUS$
GHG emissions/cap	10.2	$tCO_2eq./cap$
GDP PPP/cap	11.9	ths US$/cap
Cum. GHG 1900 to 2004	7.9	$tCO_2eq./cap/y$

Change from 1990 to 2004



	90-04	Meter
GHG emissions/GDP PPP	▼	
TPES/GDP PPP	▼	
GHG emissions/cap	▼	
GDP PPP/cap	▲	
Cum. GHG 1900 to 2004	▲	

Primary energy supply

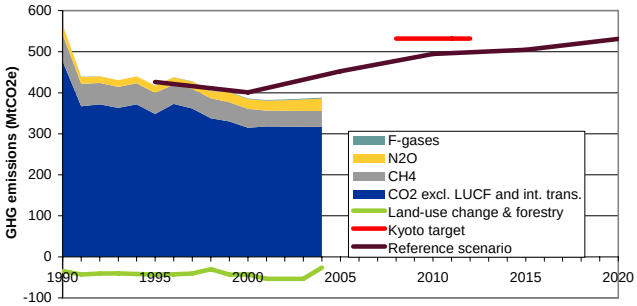


	Share in 2004
Biomass/waste	5.6%
Solar/wind/other	0.0%
Geothermal	0.0%
Hydro	0.2%
Nuclear	
Gas	11.9%
Oil	21.4%
Coal	61.0%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_20	F-gas
$0	$MtCO_2eq$					
	% gas					
	& tot.GHG					
$30	$MtCO_2eq$	130	130			
	% gas	29%	29%			
	& tot.GHG	24%	24%			

Historic and projected GHG emissions

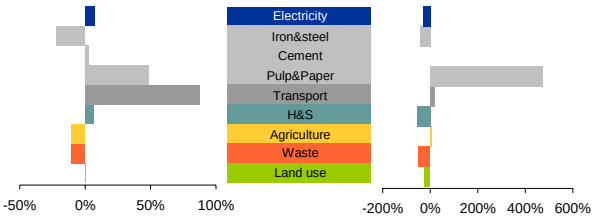


	Share in 2004
F-Gases	1%
N_2O	8%
CH_4	10%
CO_2 excluding LUCF	82%
Kyoto target (KT)	-6.0%
Current CO_2 (90-04)	-33.6%
Current non-CO_2 (90/95-04)	-20.0%
Current total GHGs (90/95-04)	-31.4%
Difference with KT	-25.4%

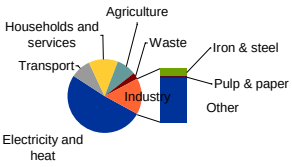
Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity	0.662	$kgCO_2$ per kWh	▲	
Share of ren. energy (RES)	6%		▲	
Incr. of RE over 1990-2004	3%			
Access to electricity	100%			
Industry				
Energy efficiency index	1.8			
Emissions per t steel	0.9	tCO_2 per t steel		
Emissions per t cement		tCO_2 per t cement		
Emissions per t pulp&paper	1.6	tCO_2 per t pulp&paper		
Transport				
Emissions per capita	0.90	$tCO_2eq.$	▲	
Household & services				
Emissions per capita	1.29	$tCO_2eq.$	▼	
Agriculture				
Emissions per capita	0.88	$tCO_2eq.$	▲	
Waste				
Emissions per capita	0.28	$tCO_2eq.$	▼	
Land use change				
Emissions per capita	-0.69	$tCO_2eq.$	▼	
International aviation and shipping				
Emissions per capita	0.04	$tCO_2eq.$	▼	

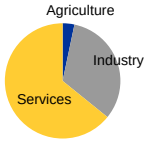
Change in production — **1990 to 2004** — **Change in emissions**



Emissions per sector 2004



GDP per sector 2004



Energy investment

Total energy research and development 2004	mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	°/₀₀	Share (per year) of total GDP	°/₀₀

Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, Annex I, Gleneagles dialogue
National GHG targets	Special base year 1988 instead of 1990
Energy related targets	Increase share of RE in primary energy production by 14% by 2020 and increase to 1% energy recovered from waste by 2020. Renewable Electricity Directive provides a target of 7.5% of electricity consumption from renewable sources by 2010 Biofuels Directive provides indicative target of 5.75% share of biofuels in transport fuel by 2010 for each member state
General climate policies	National programme for integration with the EU; National Environmental Policy for 2003–2006 with Perspectives for 2007–2010 (2002); Second National Environmental Policy (2001); Poland 2025: long-term strategy for sustainable development (2000); Assumptions for Poland's energy policy until 2020 (2000); Framework plan for implementation of the energy policy assumptions
Electricity	EU ETS. Hard coal mining restructuring reform. Decentralisation of energy market. Obligation to purchase electricity from CHPs and renewable sources.
Industry	EU ETS. Replacement of F-gases in the refrigeration industry. Enforcement of energy saving techniques.
Transport	Introduction of differential fuel taxes. Promotion of biofuels. National Transport Policy for 2001–2015; Second National Environmental Policy (2001); draft climate change strategy (under consideration)
Households	Grants for building insulation and modernisation of heating systems.
Agriculture	Many schemes to improve soil productivity and land and livestock management.
Waste	Waste Act. Strong investments in degassing installations. 2%/y of waste to be converted into compost. Biogas recovery from wastewater.
CDM, JI and IET	Early involvement with 5 JI projects. AIJ projects with Canada, the Netherlands and Norway have been hosted.

Summary

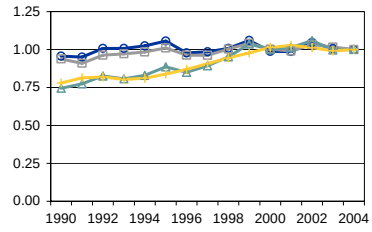
Economy: GDP and energy consumption almost flat between 1990 and 2004. Very strong decrease in GHG/GDP, while GDP/cap has been increasing.
Emissions: Emissions are significantly below Kyoto Target. Emission projections are high compared to current developments.
Policies: Old plants and industries in the process of renovation with emphasis on energy efficiency. Limited renewable energy schemes in place. Strong reliance on coal in the past now going towards a mix of fuels.

Climate fact sheet — Portugal

Economy-wide indicators

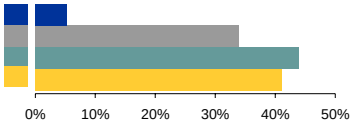
Factors driving emissions (population, GDP, energy and GHG)

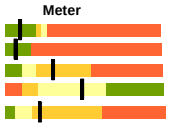
Trends



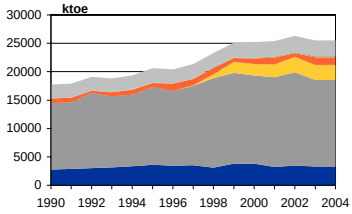
	2004		90-04	Meter
Population	10,520	ths people		
GDP (PPP)	189	bln US$ (2000)		
Prm. Energy Sply.(TPES)	25,538	ktoe		
GHG emissions	85	$MtCO_2eq.$		
GHG emissions/GDP PPP	0.447	$kgCO_2eq./US$	▲	
TPES/GDP PPP	135	toe/MUS$	▲	
GHG emissions/cap	8.0	$tCO_2eq./cap$	▲	
GDP PPP/cap	18.0	ths US$/cap	▲	
Cum. GHG 1900 to 2004	2.9	$tCO_2eq./cap/y$	▲	

Change from 1990 to 2004





Primary energy supply

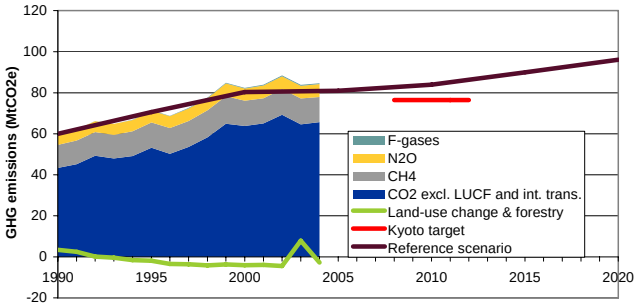


	Share in 2004
Biomass/waste	11.1%
Solar/wind/other	0.2%
Geothermal	0.3%
Hydro	5.3%
Nuclear	
Gas	10.3%
Oil	59.8%
Coal	12.8%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_2O	F-gas
$0	$MtCO_2eq$					
	% gas					
	& tot.GHG					
$30	$MtCO_2eq$	4	4			
	% gas	5%	5%			
	& tot.GHG	4%	4%			

Historic and projected GHG emissions

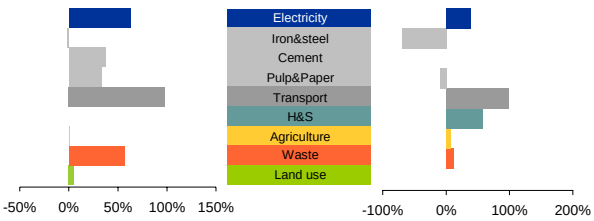


	Share in 2004
F-Gases	1%
N_2O	7%
CH_4	14%
CO_2 excluding LUCF	78%
Kyoto target (KT)	27.0%
Current CO_2 (90-04)	51.5%
Current non-CO_2 (90/95-04)	12.9%
Current total GHGs (90/95-04)	40.7%
Difference with KT	13.7%

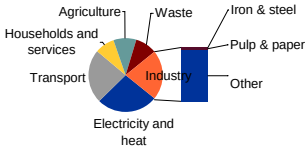
Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity	0.414	$kgCO_2$ per kWh	▼	
Share of ren. energy (RES)	17%		▼	
Incr. of RE over 1990-2004	-1%			
Access to electricity	100%			
Industry				
Energy efficiency index	1.3			
Emissions per t steel	0.2	tCO_2 per t steel		
Emissions per t cement		tCO_2 per t cement		
Emissions per t pulp&paper	0.3	tCO_2 per t pulp&paper		
Transport				
Emissions per capita	1.91	$tCO_2eq.$	▲	
Household & services				
Emissions per capita	0.70	$tCO_2eq.$	▲	
Agriculture				
Emissions per capita	0.80	$tCO_2eq.$	▲	
Waste				
Emissions per capita	0.76	$tCO_2eq.$	▲	
Land use change				
Emissions per capita	-0.26	$tCO_2eq.$	▼	
International aviation and shipping				
Emissions per capita	0.40	$tCO_2eq.$	▲	

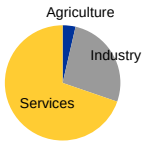
Change in production — **1990 to 2004** — **Change in emissions**



Emissions per sector 2004

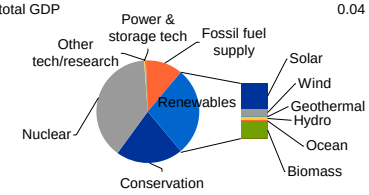


GDP per sector 2004



Energy investment

Total energy research and development 2004	0.0 mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	0.04 °/₀₀	Share (per year) of total GDP	°/₀₀



Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, Annex I
National GHG targets	
Energy related targets	39% of electricity consumption to come from RES by 2010. Biofuels to reach 5.75% of transport fuels by 2010. Reduction in energy distribution losses by 8,6% by 2010. Cogeneration to increase to 18% of gross electricity consumption by 2010. Increase energy efficiency in buildings by ca 40%.
General climate policies	National Climate Change Programme (PNAC 2006).
Electricity	EU ETS. "Energy efficieny and renewable enerctricity (E4 + E-RES" Programme. Feed-in tariff for renewable electricity. Reduction in energy distribution losses by 8,6% by 2010. Cogeneration to increase to 18% of gross electricity consumption by 2010.
Industry	EU ETS. Tax increase on industrial fuels. Voluntary agreements for energy efficiency programmes.
Transport	Tax harmonization between diesel fuel for heating and for transport by 2014. Incentives for gas fuelled cars. Biofuels to reach 5.75% of transport fuels by 2010.
Households	Increase energy efficiency in buildings by ca 40%. Promotion of domestic solar thermal. New target of 100,000 m2/y solar panels during 2007-2020.
Agriculture	Adoption of cropland management and grazing land management activities.
Waste	Decree-Law 366-A/97, of 20th December on packaging. Recycling of packaging.
CDM, JI and IET	Several CDM projects considered.

Summary

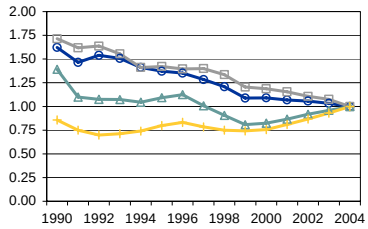
Economy: Strong increase in GDP/cap
Emissions: GHG emissions are growing faster than GDP. Emission signifcantly higher than the Kyoto target, target will be very difficult to achieve.
Fuels: Substantial increase of oil and gas use in the last decade. Oil strongly dominates fuel supply. Large gap with renewable electricity target.
Policy: EU ETS and flexible mechanism used to try to achieve targets. Feed-in tariffs for renewable electricity. Strong emphasis on energy efficiency improvements.

Climate fact sheet — Romania

Economy-wide indicators

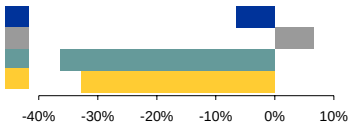
Factors driving emissions (population, GDP, energy and GHG)

Trends

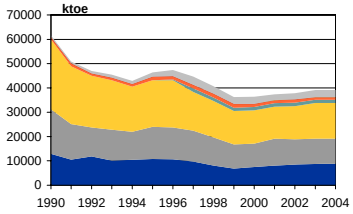


	2004		90-04	Meter
Population	21,690	ths people		
GDP (PPP)	169	bln US$ (2000)		
Prm. Energy Sply.(TPES)	39,188	ktoe		
GHG emissions	155	$MtCO_2eq.$		
GHG emissions/GDP PPP	0.915	$kgCO_2eq./US$	▼	
TPES/GDP PPP	232	toe/MUS$	▼	
GHG emissions/cap	7.1	$tCO_2eq./cap$	▼	
GDP PPP/cap	7.8	ths US$/cap	▲	
Cum. GHG 1900 to 2004	4.4	$tCO_2eq./cap/y$	▲	

Change from 1990 to 2004



Primary energy supply

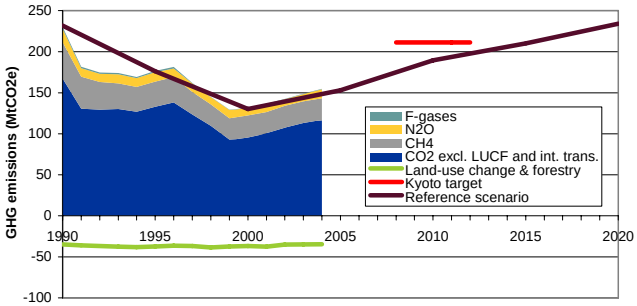


	Share in 2004
Biomass/waste	7.5%
Solar/wind/other	
Geothermal	0.0%
Hydro	2.9%
Nuclear	3.3%
Gas	37.6%
Oil	26.3%
Coal	22.4%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_20	F-gas
$0	$MtCO_2eq$					
	% gas					
	& tot.GHG					
$30	$MtCO_2eq$					
	% gas					
	& tot.GHG					

Historic and projected GHG emissions

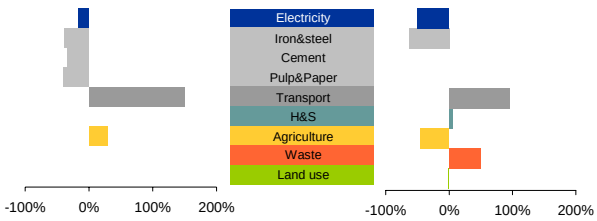


	Share in 2004
F-Gases	0%
N_2O	7%
CH_4	17%
CO_2 excluding LUCF	75%
Kyoto target (KT)	-8.0%
Current CO_2 (90-04)	-30.4%
Current non-CO_2 (90/95-04)	-38.9%
Current total GHGs (90/95-04)	-32.7%
Difference with KT	-24.7%

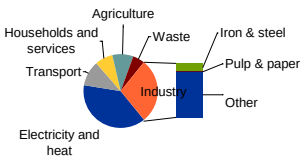
Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity	0.451	$kgCO_2$ per kWh	▼	
Share of ren. energy (RES)	10%		▲	
Incr. of RE over 1990-2004	8%			
Access to electricity	100%			
Industry				
Energy efficiency index	2.8			
Emissions per t steel	1.1	tCO_2 per t steel		
Emissions per t cement		tCO_2 per t cement		
Emissions per t pulp&paper	1.6	tCO_2 per t pulp&paper		
Transport				
Emissions per capita	0.79	$tCO_2eq.$	▲	
Household & services				
Emissions per capita	0.56	$tCO_2eq.$	▲	
Agriculture				
Emissions per capita	0.64	$tCO_2eq.$	▼	
Waste				
Emissions per capita	0.39	$tCO_2eq.$	▲	
Land use change				
Emissions per capita	-1.60	$tCO_2eq.$	▲	
International aviation and shipping				
Emissions per capita	0.02	$tCO_2eq.$	▲	

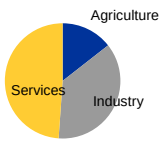
Change in production — **1990 to 2004** — **Change in emissions**



Emissions per sector 2004



GDP per sector 2004



Energy investment

Total energy research and development 2004	mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	°/₀₀	Share (per year) of total GDP	°/₀₀

Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, Annex I
National GHG targets	
Energy related targets	Renewable Electricity Directive provides a target of 33% of electricity consumption from renewable sources by 2010. In 2004, the Romanian government introduced a quota system with tradable green certificates (TGC) to support renewable electricity. The mandatory quota for electricity suppliers was 0.7% in 2005, increasing to 4.3% in 2010. TGCs are issued for electricity production from wind, solar, biomass or hydropower generated in plants with capacity smaller than 10 MW. Biofuels Directive provides indicative target of 5.75% share of biofuels in transport fuel by 2010 for each member state
General climate policies	Governmental Programme 2005-2008, National Strategy for Climate Change (2005).
Electricity	National Strategy for Energy Efficiency for 2004-2015. The formal body responsible for the implementation of the energy efficiency policy is the Romanian Agency for Energy Conservation (ARCE). Cernavoda nuclear plant cover 10% of power demand, when the second plants will be completed this will be 18%. The market is not totally deregulated yet.
Industry	The Industrial Policy Paper (2004) establishes medium-2010- and long term objectives-2013. Integrates in the economical growth the concept of sustainability and BAT.
Transport	Department of environment established within the Ministry of Transport. Main objectives is to modernise transport infrastructures.
Households	No specific policies in the domestic sector.
Agriculture	National Strategic Plan for Agriculture and Rural Development for 2007-2013. Measures in place for crop diversification. Targets for afforestation: 32% of forest areas by 2013 compared to 27% in 2006.
Waste	National Waste Management Strategy for 2003-13. Romania has committed to observe the landfill Directive provisions by 2017, as from 2008, to separately collect biodegradable municipal waste at a rate of 8%, and to meet the incineration requirements by 2009.
CDM, JI and IET	15 JI projects were approved and are in different stages of development. Emission reductions to be generated is ~8.8MtCO2e in 2008-2012.

Summary

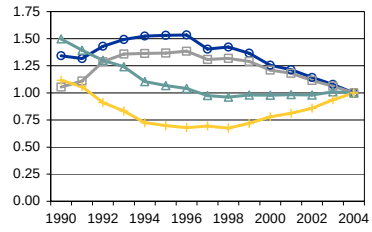
Economy: joined the EU in 2007.
Emissions: substantial decrease in emissions partially due to a decrease in primary energy supply. Emissions have decreased in all sectors except transport (+100%) and waste (+50%) since 1990.
Fuels: heavily dependent on fossil fuels but with a high penetration of biomass compared to other Eastern European countries.
Policy: major investments in updating facilities and revamping the economy, limited energy efficiency measures and specific targets. No incentives and no taxes. Most measures are concentrated on compliance with EU legislations and requirements for the accession.

Climate fact sheet — Russian Federation

Economy-wide indicators

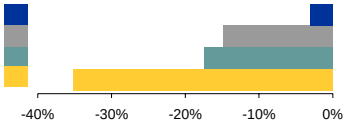
Factors driving emissions (population, GDP, energy and GHG)

Trends

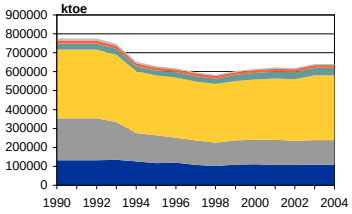


	2004		90-04	Meter
Population	143,850	ths people		
GDP (PPP)	1,309	bln US$ (2000)		
Prm. Energy Sply.(TPES)	640,868	ktoe		
GHG emissions	1,938	$MtCO_2eq.$		
GHG emissions/GDP PPP	1.481	$kgCO_2eq./US$	▼	
TPES/GDP PPP	490	toe/MUS$	▼	
GHG emissions/cap	13.5	$tCO_2eq./cap$	▼	
GDP PPP/cap	9.1	ths US$/cap	▼	
Cum. GHG 1900 to 2004	7.1	$tCO_2eq./cap/y$	▲	

Change from 1990 to 2004



Primary energy supply

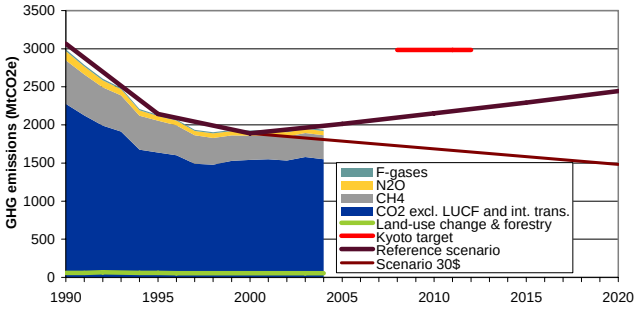


	Share in 2004
Biomass/waste	1.0%
Solar/wind/other	0.0%
Geothermal	0.0%
Hydro	2.1%
Nuclear	6.2%
Gas	53.4%
Oil	20.5%
Coal	16.8%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_2O	F-gas
$0	$MtCO_2eq$			20	35	10
	% gas			6%	56%	29%
	& tot.GHG			1%	1%	0%
$30	$MtCO_2eq$	800	800	105	39	17
	% gas	40%	40%	30%	63%	48%
	& tot.GHG	33%	33%	4%	2%	1%

Historic and projected GHG emissions



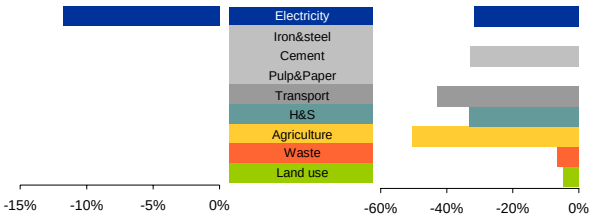
	Share in 2004
F-Gases	1%
N_2O	3%
CH_4	16%
CO_2 excluding LUCF	80%

Kyoto target (KT)	0.0%
Current CO_2 (90-04)	-32.0%
Current non-CO_2 (90/95-04)	-45.0%
Current total GHGs (90/95-04)	-35.1%
Difference with KT	-35.1%

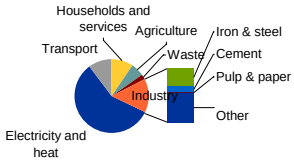
Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity	0.329	$kgCO_2$ per kWh		
Share of ren. energy (RES)	3%		▼	
Incr. of RE over 1990-2004	0%			
Access to electricity	100%			
Industry				
Energy efficiency index	2.5			
Emissions per t steel	1.4	tCO_2 per t steel		
Emissions per t cement	0.8	tCO_2 per t cement		
Emissions per t pulp&paper	0.1	tCO_2 per t pulp&paper		
Transport				
Emissions per capita	1.35	$tCO_2eq.$	▼	
Household & services				
Emissions per capita	1.33	$tCO_2eq.$	▼	
Agriculture				
Emissions per capita	0.76	$tCO_2eq.$	▼	
Waste				
Emissions per capita	0.34	$tCO_2eq.$	▼	
Land use change				
Emissions per capita	0.38	$tCO_2eq.$	▼	
International aviation and shipping				
Emissions per capita	0.21	$tCO_2eq.$	▲	

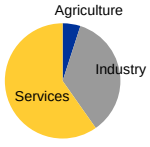
Change in production — **1990 to 2004** — **Change in emissions**



Emissions per sector 2004

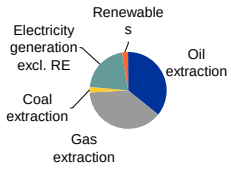


GDP per sector 2004



Energy investment

Total energy research and development 2004	mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	2700 mln US$ (2000)
Share of total GDP	°/₀₀	Share (per year) of total GDP	0.82 °/₀₀



Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, Annex I, Gleneagles dialogue
National GHG targets	
Energy related targets	
General climate policies	Very few climate policies in place. Climate change policy mainly builds on the energy efficiency part of the National Energy Strategy.
Electricity	Energy efficiency and energy saving programmes. Long-term plan to develop nuclear and renewable energies. Programme to phase out subsidies to fossil based energy production.
Industry	Programme to increase energy efficiency. Improve gas based technologies and increase coal quality.
Transport	Federal Target Programme Energy-efficient Economy for 2002-5 with an outlook to 2010. Concept of Development of the Auto Industry to 2010. Increase the share of biofuels.
Households	Limited policies on the domestic sector.
Agriculture	Several programmes to promote environmentally friendly agricultural practices.
Waste	Waste law. Set-up of the registry of state landfills.
CDM, JI and IET	Hosted 10 AIJ projects with the United States of America, the Netherlands and Germany. Interest in JI project (from Gazprom in particular)

Summary

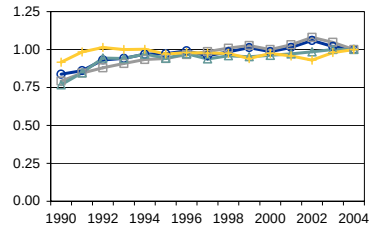
Economy: GDP slumped in the decade to 2000 but has been growing since. Population also decreased over the period.
Investment data: Russia has invested $269bn in energy projects, of which $7bn in renewable energy projects.
Emissions: Emissions per capita are low for Annex 1 countries. Total emissions are well below the Kyoto target and have decreased in all sectors.
Fuels: The share of renewables is low and gas is a large part of the energy supply. Emissions intensity in electricty is high because of the dominance of fossil fuels
Policy: Very few climate policies in place, those that are concentrate on energy efficiency. Russia is already hosting AIJ projects and is interested in JI.

Climate fact sheet — Saudi Arabia

Economy-wide indicators

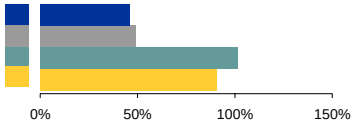
Factors driving emissions (population, GDP, energy and GHG)

Trends



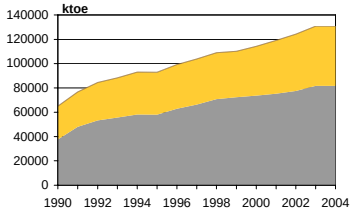
	2004	
Population	23,950	ths people
GDP (PPP)	304	bln US$ (2000)
Prm. Energy Sply.(TPES)	130,783	ktoe
GHG emissions	371	$MtCO_2eq.$

Change from 1990 to 2004



			90-04	Meter
GHG emissions/GDP PPP	1.220	$kgCO_2eq./US$	▲	
TPES/GDP PPP	430	toe/MUS$	▲	
GHG emissions/cap	15.5	$tCO_2eq./cap$	▲	
GDP PPP/cap	12.7	ths US$/cap	▲	
Cum. GHG 1900 to 2004	3.0	$tCO_2eq./cap/y$	▲	

Primary energy supply

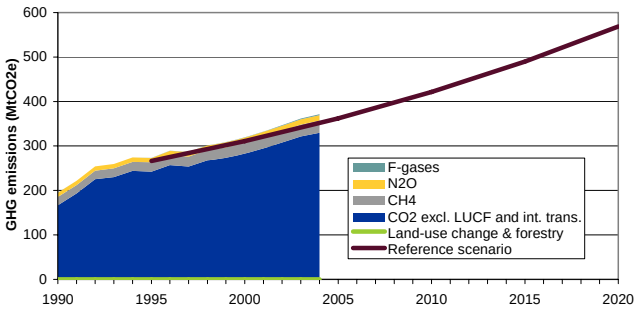


	Share in 2004
Biomass/waste	0.0%
Solar/wind/other	
Geothermal	
Hydro	
Nuclear	
Gas	37.5%
Oil	62.5%
Coal	

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_2O	F-gas
$0	$MtCO_2eq$					
	% gas					
	& tot.GHG					
$30	$MtCO_2eq$					
	% gas					
	& tot.GHG					

Historic and projected GHG emissions



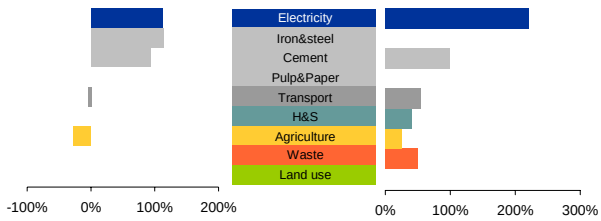
	Share in 2004
F-Gases	1%
N_2O	3%
CH_4	7%
CO_2 excluding LUCF	89%

Current CO_2 (90-04)	97.8%
Current non-CO_2 (90/95-04)	46.6%
Current total GHGs (90/95-04)	90.4%

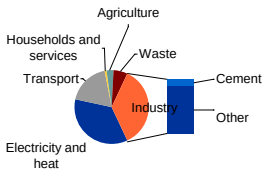
Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity	0.749	$kgCO_2$ per kWh	▼	
Share of ren. energy (RES)	0%		▼	
Incr. of RE over 1990-2004	0%			
Access to electricity	98%			
Industry				
Energy efficiency index	3.3			
Emissions per t steel	0.0	tCO_2 per t steel		
Emissions per t cement	0.8	tCO_2 per t cement		
Emissions per t pulp&paper		tCO_2 per t pulp&paper		
Transport				
Emissions per capita	2.88	$tCO_2eq.$	▲	
Household & services				
Emissions per capita	0.16	$tCO_2eq.$	▼	
Agriculture				
Emissions per capita	0.49	$tCO_2eq.$	▼	
Waste				
Emissions per capita	0.93	$tCO_2eq.$	▲	
Land use change				
Emissions per capita	0.00	$tCO_2eq.$		
International aviation and shipping				
Emissions per capita	0.63	$tCO_2eq.$	▲	

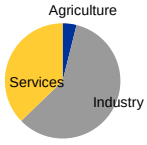
Change in production — **1990 to 2004** — **Change in emissions**



Emissions per sector 2004



GDP per sector 2004



Energy investment

Total energy research and development 2004	mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	°/₀₀	Share (per year) of total GDP	°/₀₀

Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, G77 & China, OPEC
National GHG targets	
Energy related targets	
General climate policies	No specific policy in place. General energy efficiency programme in place for energy intensive industries.
Electricity	Switch to gas. Some emission reduction and efficiency measures in place more for economical reasons than for care for environment.
Industry	ISO EMS implemented on a voluntary basis. Energy efficiency programme.
Transport	No fuel tax. Promotion for public transport to ease congestion in cities.
Households	Promotion of water use efficiency.
Agriculture	Water-use efficiency. Irrigation programmes. Desertification reduction programme.
Waste	Voluntary recycling but not many facilities in place. No formal policy on waste minimisation and separation.
CDM, JI and IET	CDM considered.

Summary

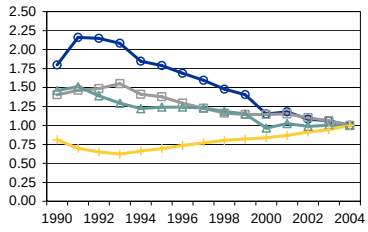
Economy: Heavily energy-centred economy with climate change issues as a low priority. Has 25% of the world's proven oil reserves and is likely to remain the world's largest net oil exporter in the next future.
Emissions: Strongly increasing in line with increasing energy consumption, doubled since 1990.
Policy: The lack of policies reflects the belief that all measures except for CDM will have a substantial impact on the economy compared to other non-oil producing developing countries.

Climate fact sheet — Slovakia

Economy-wide indicators

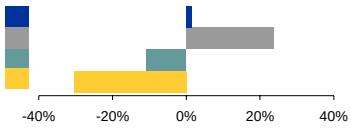
Factors driving emissions (population, GDP, energy and GHG)

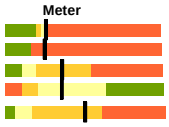
Trends



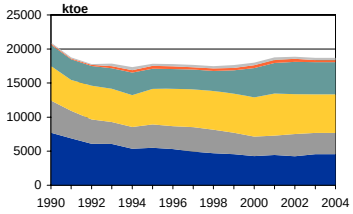
	2004		90-04	Meter
Population	5,380	ths people		
GDP (PPP)	72	bln US$ (2000)		
Prm. Energy Sply.(TPES)	18,715	ktoe		
GHG emissions	51	$MtCO_2eq.$		
GHG emissions/GDP PPP	0.705	$kgCO_2eq./US$	▼	
TPES/GDP PPP	259	toe/MUS$	▼	
GHG emissions/cap	9.5	$tCO_2eq./cap$	▼	
GDP PPP/cap	13.4	ths US$/cap	▲	
Cum. GHG 1900 to 2004	6.4	$tCO_2eq./cap/y$	▲	

Change from 1990 to 2004





Primary energy supply

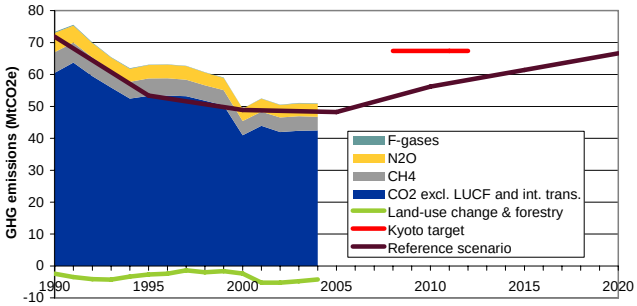


	Share in 2004
Biomass/waste	1.8%
Solar/wind/other	0.0%
Geothermal	0.0%
Hydro	1.6%
Nuclear	25.1%
Gas	30.3%
Oil	16.7%
Coal	24.4%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_2O	F-gas
$0	$MtCO_2eq$					
	% gas					
	& tot.GHG					
$30	$MtCO_2eq$					
	% gas					
	& tot.GHG					

Historic and projected GHG emissions



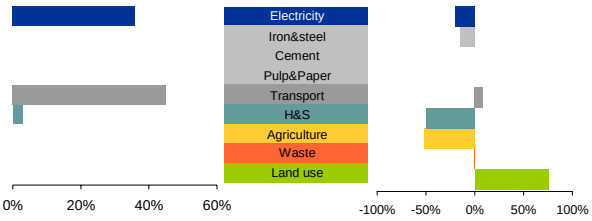
	Share in 2004
F-Gases	0%
N_2O	8%
CH_4	8%
CO_2 excluding LUCF	83%

Kyoto target (KT)	-8.0%
Current CO_2 (90-04)	-29.8%
Current non-CO_2 (90/95-04)	-32.8%
Current total GHGs (90/95-04)	-30.3%
Difference with KT	-22.3%

Sectoral indicators

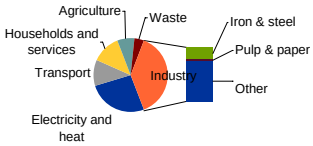
	2004		90-04	Meter
Electricity				
Emissions intensity	0.255	$kgCO_2$ per kWh	▼	
Share of ren. energy (RES)	3%		▲	
Incr. of RE over 1990-2004	2%			
Access to electricity	100%			
Industry				
Energy efficiency index	2.1			
Emissions per t steel	1.0	tCO_2 per t steel		
Emissions per t cement		tCO_2 per t cement		
Emissions per t pulp&paper	1.0	tCO_2 per t pulp&paper		
Transport				
Emissions per capita	1.06	$tCO_2eq.$	▲	
Household & services				
Emissions per capita	1.19	$tCO_2eq.$	▼	
Agriculture				
Emissions per capita	0.72	$tCO_2eq.$	▼	
Waste				
Emissions per capita	0.39	$tCO_2eq.$	▼	
Land use change				
Emissions per capita	-0.79	$tCO_2eq.$	▲	
International aviation and shipping				
Emissions per capita	0.03	$tCO_2eq.$		

Change in production 1990 to 2004

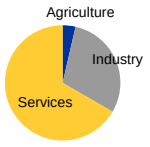


Change in emissions

Emissions per sector 2004



GDP per sector 2004



Energy investment

Total energy research and development 2004	mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	°/₀₀	Share (per year) of total GDP	°/₀₀

Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, Annex I
National GHG targets	
Energy related targets	Renewable Electricity Directive provides a target of 31% of electricity consumption from renewable sources by 2010 Biofuels Directive provides indicative target of 5.75% share of biofuels in transport fuel by 2010 for each member state
General climate policies	National environmental action plan II (1996). Strategy, principle and priorities of the states environmental policy (1993)
Electricity	Management programme on the development of renewable energy sources (2002). Promotion of energy efficiency. Plans to introduce mandatory share of renewable electricity in the next future.
Industry	IPPC Directive of the EC. Measures in place to reduce F-gases, N2O and PFCs.
Transport	5.25% share of biofuel in transport fuel by 2010. Limits on emissions of air pollutants from vehicles.
Households	Energy efficiency in buildings. Standards in public buildings
Agriculture	Livestock management policy, adaptation and forest management policy. Several policies on protection of agricultural soil.
Waste	Waste management and minimisation programme in place. Targets for recycling also in place.
CDM, JI and IET	No particular action is taken with regard to JI projects.

Summary

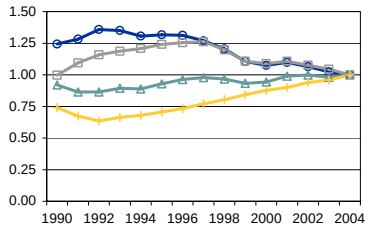
Economy: increasing economic performance after the split from the Czechs in 1993.
Emissions: despite the healthy economy and the increase in electricity production emissions have consistently decreased over the period. This is partially due to a decrease in primary energy supply and also to a larger use of nuclear in the fuel mix. Well on target for 2012.
Fuels: Largely dominated by gas but nuclear and coal are close in second position. Coal use has decreased in line with the increase in nuclear power.
Policy: Part of the EU ETS. Climate policies in most sectors. Hosting JI projects is not planned.

Climate fact sheet — Slovenia

Economy-wide indicators

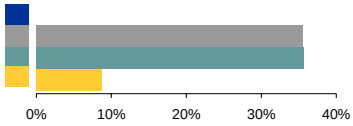
Factors driving emissions (population, GDP, energy and GHG)

Trends

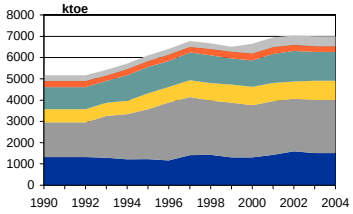


	2004		90-04	Meter
Population	2,000	ths people		
GDP (PPP)	38	bln US$ (2000)		
Prm. Energy Sply.(TPES)	7,006	ktoe		
GHG emissions	20	$MtCO_2eq.$		
GHG emissions/GDP PPP	0.522	$kgCO_2eq./US$	▼	
TPES/GDP PPP	182	toe/MUS$	▲	
GHG emissions/cap	10.0	$tCO_2eq./cap$	▲	
GDP PPP/cap	19.2	ths US$/cap	▲	
Cum. GHG 1900 to 2004	5.1	$tCO_2eq./cap/y$	▲	

Change from 1990 to 2004



Primary energy supply

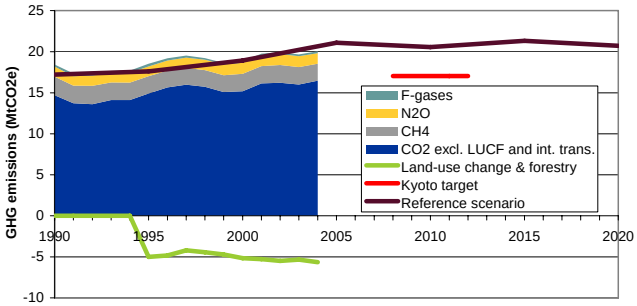


	Share in 2004
Biomass/waste	6.7%
Solar/wind/other	
Geothermal	
Hydro	3.9%
Nuclear	19.4%
Gas	12.9%
Oil	35.5%
Coal	21.6%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_20	F-gas
$0	$MtCO_2eq$					
	% gas					
	& tot.GHG					
$30	$MtCO_2eq$	0	0			
	% gas	0%	0%			
	& tot.GHG	0%	0%			

Historic and projected GHG emissions

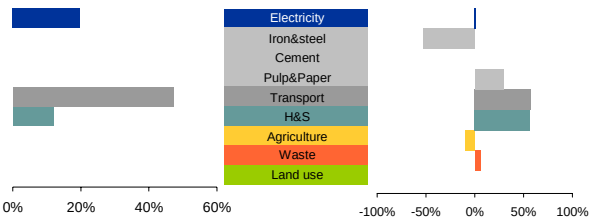


	Share in 2004
F-Gases	1%
N_2O	6%
CH_4	10%
CO_2 excluding LUCF	82%
Kyoto target (KT)	-8.0%
Current CO_2 (90-04)	12.1%
Current non-CO_2 (90/95-04)	-6.1%
Current total GHGs (90/95-04)	8.4%
Difference with KT	16.4%

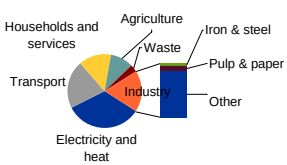
Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity	0.363	$kgCO_2$ per kWh	▲	
Share of ren. energy (RES)	11%		▼	
Incr. of RE over 1990-2004	0%			
Access to electricity	100%			
Industry				
Emissions per t steel	0.3	tCO_2 per t steel		
Emissions per t cement		tCO_2 per t cement		
Emissions per t pulp&paper	2.3	tCO_2 per t pulp&paper		
Transport				
Emissions per capita	2.13	$tCO_2eq.$	▲	
Household & services				
Emissions per capita	1.41	$tCO_2eq.$	▲	
Agriculture				
Emissions per capita	1.01	$tCO_2eq.$	▼	
Waste				
Emissions per capita	0.32	$tCO_2eq.$	▲	
Land use change				
Emissions per capita	-2.82	$tCO_2eq.$		
International aviation and shipping				
Emissions per capita	0.03	$tCO_2eq.$		

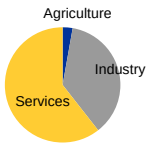
Change in production 1990 to 2004 Change in emissions



Emissions per sector 2004



GDP per sector 2004



Energy investment

Total energy research and development 2004	mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	°/₀₀	Share (per year) of total GDP	°/₀₀

Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, Annex I
National GHG targets	Special base year 1986 instead of 1990
Energy related targets	33.6% electrical energy from RES in 2010. Doubling cogeneration electricity by 2010 from 2000 levels. Biofuels Directive provides indicative target of 5.75% share of biofuels in transport fuel by 2010 for each member state Doubling cogeneration electricity by 2010 from 2000 levels.
General climate policies	Action Plan for Reducing GHG Emissions (AP-GHG) (2004).CO2 tax in place. Environmental tax reform. Directive on energy taxation
Electricity	EU ETS. Feed-in tariffs. Financial incentives for RE projects. Energy efficiency programmes.
Industry	EU ETS. Energy efficiency promotion and eco-labelling.
Transport	Tax on motor fuels. Technical control of vehicles. Promotion of biofuels.
Households	Decree on Thermal Protection and Efficient Energy Use in Buildings. Energy labelling of household devices. Incentives for domestic RE projects.
Agriculture	Slovenian Agricultural-Environmental Programme (2001). Programme of Countryside Development. Promotion of biogas for electricity and heat production.
Waste	Waste disposal tax. Separate waste collection and packaging waste management plan.
CDM, JI and IET	Since Slovenia has difficulties meeting its Kyoto target it is not interested in hosting JI projects.

Summary

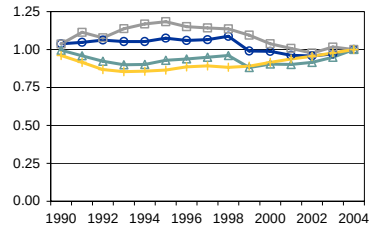
Economy: Unlike some other Central European countries, Slovenia has had very stable GDP growth. GDP/cap increased strongly since 1992.
Emissions: Only Eastern European country with emissions higher than Kyoto targets .
Fuels: Much of the growth in primary energy supply has come from increased oil use. Far sjort of RE target.
Policy: Part of the EU ETS. Policies in most sectors. Not interesting in hosting JI projects.

Climate fact sheet — South Africa

Economy-wide indicators

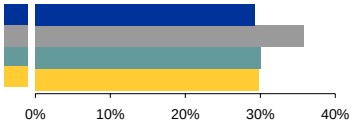
Factors driving emissions (population, GDP, energy and GHG)

Trends

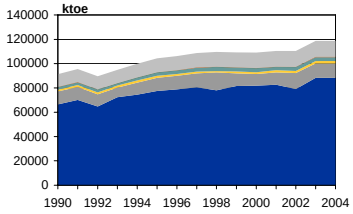


	2004		90-04	Meter
Population	45,510	ths people		
GDP (PPP)	468	bln US$ (2000)		
Prm. Energy Sply.(TPES)	118,744	ktoe		
GHG emissions	505	$MtCO_2eq.$		
GHG emissions/GDP PPP	1.079	$kgCO_2eq./US$	▼	
TPES/GDP PPP	254	toe/MUS$	▼	
GHG emissions/cap	11.1	$tCO_2eq./cap$	▲	
GDP PPP/cap	10.3	ths US$/cap	▲	
Cum. GHG 1900 to 2004	3.6	$tCO_2eq./cap/y$	▲	

Change from 1990 to 2004



Primary energy supply

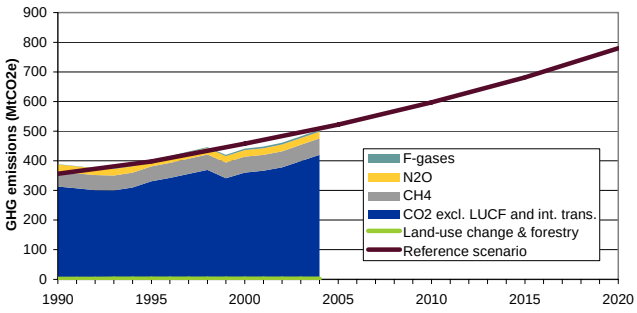


	Share in 2004
Biomass/waste	11.1%
Solar/wind/other	
Geothermal	
Hydro	0.1%
Nuclear	2.8%
Gas	1.5%
Oil	10.2%
Coal	74.3%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_20	F-gas
$0	$MtCO_2eq$					
	% gas					
	& tot.GHG					
$30	$MtCO_2eq$					
	% gas					
	& tot.GHG					

Historic and projected GHG emissions



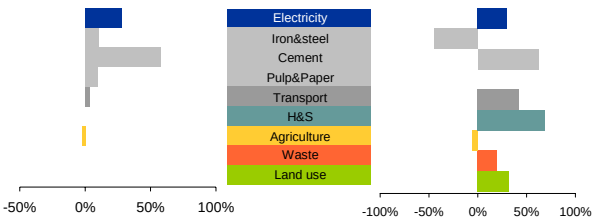
	Share in 2004
F-Gases	1%
N_2O	5%
CH_4	11%
CO_2 excluding LUCF	83%

Current CO_2 (90-04)	34.3%
Current non-CO_2 (90/95-04)	11.1%
Current total GHGs (90/95-04)	29.7%

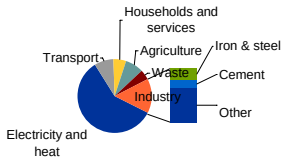
Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity	0.853	$kgCO_2$ per kWh	▲	
Share of ren. energy (RES)	11%		▼	
Incr. of RE over 1990-2004	0%			
Access to electricity	66%			
Industry				
Energy efficiency index	2.5			
Emissions per t steel	1.7	tCO_2 per t steel		
Emissions per t cement	0.9	tCO_2 per t cement		
Emissions per t pulp&paper	0.1	tCO_2 per t pulp&paper		
Transport				
Emissions per capita	0.92	$tCO_2eq.$	▲	
Household & services				
Emissions per capita	0.60	$tCO_2eq.$	▲	
Agriculture				
Emissions per capita	0.91	$tCO_2eq.$	▼	
Waste				
Emissions per capita	0.48	$tCO_2eq.$	▼	
Land use change				
Emissions per capita	0.04	$tCO_2eq.$	▲	
International aviation and shipping				
Emissions per capita	0.22	$tCO_2eq.$	▲	

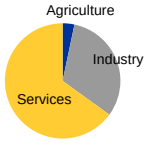
Change in production 1990 to 2004 Change in emissions



Emissions per sector 2004



GDP per sector 2004



Energy investment

Total energy research and development 2004	mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	°/₀₀	Share (per year) of total GDP	°/₀₀

Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, Gleneagles dialogue, G77 & China
National GHG targets	
Energy related targets	Renewable electricity target of additional 10000 GWh by 2013. Reduction of 12% of final energy in 2015 compared to the base case.
General climate policies	Energy efficiency strategy for energy production and the main energy-consuming sectors. Air Quality Act 39. Further legal and economical steps for future substitution of coal-based fuel by natural gas, e.g. the Gas Act. Capital subsidies for renewable energy technologies.
Electricity	White papers on renewable energy and energy policy. Development to implement a regulatory agreement on gas imports and a wholesale electricity pricing system. Planning of national energy bill to provide for integrated energy planning, renewable energy and energy efficiency issues as well as energy safety.
Industry	Energy efficiency strategy.
Transport	Vehicle emission strategy (2003). National Land Transport Transition Act (2000). White Paper on National Transport Policy (1996)
Households	Different efforts to introduce more energy efficient appliances in the domestic sector. Off-grid electrification programme (PV).
Agriculture	Land Care framework policy.
Waste	White Paper on Integrated Pollution and Waste Management (2000).
CDM, JI and IET	Host country for CDM projects (2 registered), developed CDM infrastructure.

Summary

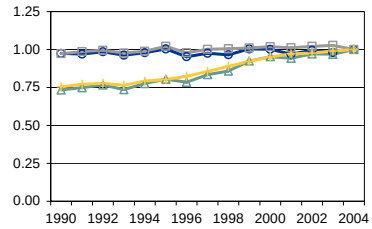
Economy: GDP growth has been much higher than the growth in emissions, i.e. GHG/GDP strongly reduced since 1998. High emissions per GDP compared to other developing countries.
Emissions: Increasing total emissions due to population and economic growth. Low emissions per capita compared to industrialised countries but high emissions compared to developing countries. per capita emissions from waste sector are high.
Fuels: Strong dependence on coal giving a very high emission intensity for electricity generation.
Policy: Efforts to slow down emission growth. Efforts to increase use of renewables. CDM activities, good CDM infrastructure.

Climate fact sheet — Spain

Economy-wide indicators

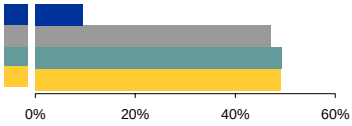
Factors driving emissions (population, GDP, energy and GHG)

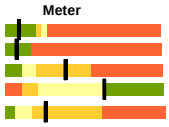
Trends



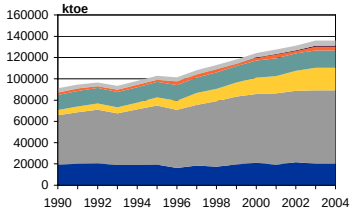
	2004		90-04	Meter
Population	42,690	ths people		
GDP (PPP)	983	bln US$ (2000)		
Prm. Energy Sply.(TPES)	135,994	ktoe		
GHG emissions	428	$MtCO_2eq.$		
GHG emissions/GDP PPP	0.435	$kgCO_2eq./US$	▲	
TPES/GDP PPP	138	toe/MUS$	▲	
GHG emissions/cap	10.0	$tCO_2eq./cap$	▲	
GDP PPP/cap	23.0	ths US$/cap	▲	
Cum. GHG 1900 to 2004	3.4	$tCO_2eq./cap/y$	▲	

Change from 1990 to 2004





Primary energy supply

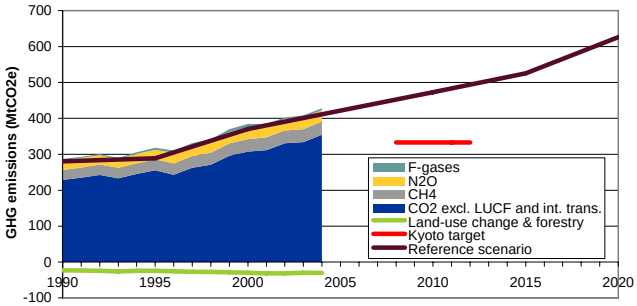


	Share in 2004
Biomass/waste	3.5%
Solar/wind/other	0.8%
Geothermal	0.0%
Hydro	2.6%
Nuclear	11.9%
Gas	15.7%
Oil	50.8%
Coal	14.8%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_2O	F-gas
$0	$MtCO_2eq$					
	% gas					
	& tot.GHG					
$30	$MtCO_2eq$	75	75			
	% gas	14%	14%			
	& tot.GHG	12%	12%			

Historic and projected GHG emissions



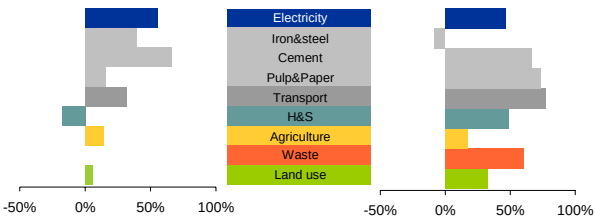
	Share in 2004
F-Gases	1%
N_2O	7%
CH_4	9%
CO_2 excluding LUCF	83%

Kyoto target (KT)	15.0%
Current CO_2 (90-04)	55.1%
Current non-CO_2 (90/95-04)	20.6%
Current total GHGs (90/95-04)	47.9%
Difference with KT	32.9%

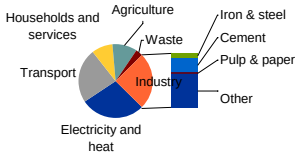
Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity	0.381	$kgCO_2$ per kWh	▼	
Share of ren. energy (RES)	7%		▲	
Incr. of RE over 1990-2004	0%			
Access to electricity	100%			
Industry				
Energy efficiency index	1.3			
Emissions per t steel	0.5	tCO_2 per t steel		
Emissions per t cement	0.6	tCO_2 per t cement		
Emissions per t pulp&paper	2.0	tCO_2 per t pulp&paper		
Transport				
Emissions per capita	2.39	$tCO_2eq.$	▲	
Household & services				
Emissions per capita	0.92	$tCO_2eq.$	▲	
Agriculture				
Emissions per capita	1.10	$tCO_2eq.$	▲	
Waste				
Emissions per capita	0.28	$tCO_2eq.$	▲	
Land use change				
Emissions per capita	-0.72	$tCO_2eq.$	▲	
International aviation and shipping				
Emissions per capita	0.77	$tCO_2eq.$	▲	

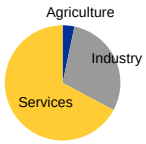
Change in production — **1990 to 2004** — **Change in emissions**



Emissions per sector 2004

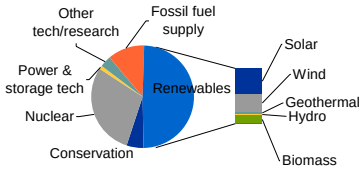


GDP per sector 2004



Energy investment

Total energy research and development 2004	0.7 mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	0.06 °/₀₀	Share (per year) of total GDP	°/₀₀



Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, Annex I, Gleneagles dialogue
National GHG targets	
Energy related targets	12% of energy production from renewables by 2010. Renewable Electricity Directive provides a target of 29.4% of electricity consumption from renewable sources by 2010 Biofuels Directive provides indicative target of 5.75% share of biofuels in transport fuel by 2010 for each member state
General climate policies	Climate Change plan 2005-2010. Energy Efficiency Strategy (E4) in place. Many incentives and grants for renewable energies.
Electricity	EU ETS. Feed-in tariff system for renewable electricity. Substantial increase in RE production capacity.
Industry	EU ETS. Voluntary agreements.
Transport	Support and development of biofuels.
Households	Energy efficiency plans for buildings. Energy saving appliances
Agriculture	Soil and livestock management programmes in place. Support for biomass.
Waste	Waste reduction programme. Push for improving recycling rates, especially glass and paper.
CDM, JI and IET	CDM adopted and many bilateral agreements in place with Latin American countries. Creation of Ibero-American Climate Change Bureau Network (RIOCC) and carbon funds.

Summary

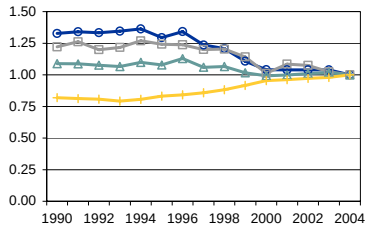
Economy: Rapid economic growth, accompanied by similar growth in energy consumption and emissions.
Emissions: Emissions per capita below the Annex 1 average but increasing.
Fuel: Most of the increase in primary energy supply has come through gas, but also oil.
Policy: Achieving the Kyoto Target will be a major challenge as emissions are well above the target. The implementation of the E4 Energy Efficiency Strategy will be pivotal for reducing emissions. Ambitious targets for renewable energy. Has one of the highest wind generation capacities in the world.

Climate fact sheet — Sweden

Economy-wide indicators

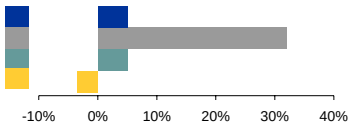
Factors driving emissions (population, GDP, energy and GHG)

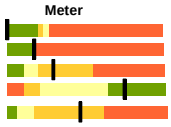
Trends



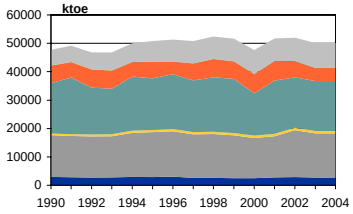
	2004		90-04	Meter
Population	8,990	ths people		
GDP (PPP)	244	bln US$ (2000)		
Prm. Energy Sply.(TPES)	50,115	ktoe		
GHG emissions	70	$MtCO_2eq.$		
GHG emissions/GDP PPP	0.286	$kgCO_2eq./US$	▼	
TPES/GDP PPP	205	toe/MUS$	▼	
GHG emissions/cap	7.8	$tCO_2eq./cap$	▼	
GDP PPP/cap	27.2	ths US$/cap	▲	
Cum. GHG 1900 to 2004	5.9	$tCO_2eq./cap/y$	▲	

Change from 1990 to 2004





Primary energy supply

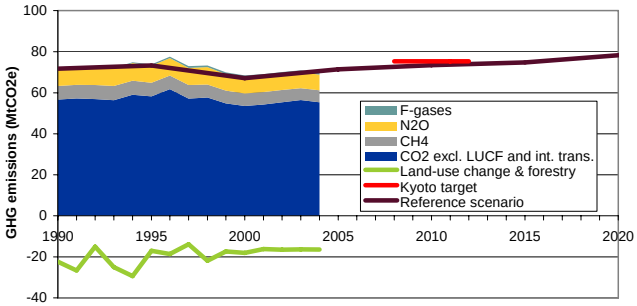


	Share in 2004
Biomass/waste	17.5%
Solar/wind/other	0.1%
Geothermal	
Hydro	9.1%
Nuclear	35.1%
Gas	1.8%
Oil	31.0%
Coal	5.4%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_20	F-gas
$0	$MtCO_2eq$					
	% gas					
	& tot.GHG					
$30	$MtCO_2eq$	0	0			
	% gas	0%	0%			
	& tot.GHG	0%	0%			

Historic and projected GHG emissions

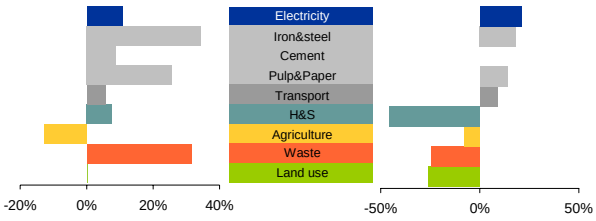


	Share in 2004
F-Gases	2%
N_2O	11%
CH_4	8%
CO_2 excluding LUCF	79%
Kyoto target (KT)	4.0%
Current CO_2 (90-04)	-2.2%
Current non-CO_2 (90/95-04)	-8.6%
Current total GHGs (90/95-04)	-3.6%
Difference with KT	-7.6%

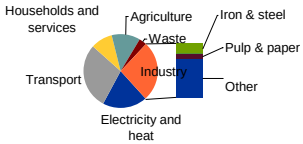
Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity	0.059	$kgCO_2$ per kWh	▲	
Share of ren. energy (RES)	27%		▲	
Incr. of RE over 1990-2004	2%			
Access to electricity	100%			
Industry				
Energy efficiency index	1.4			
Emissions per t steel	0.6	tCO_2 per t steel		
Emissions per t cement		tCO_2 per t cement		
Emissions per t pulp&paper	0.1	tCO_2 per t pulp&paper		
Transport				
Emissions per capita	2.24	$tCO_2eq.$	▲	
Household & services				
Emissions per capita	0.73	$tCO_2eq.$	▼	
Agriculture				
Emissions per capita	0.96	$tCO_2eq.$	▼	
Waste				
Emissions per capita	0.26	$tCO_2eq.$	▼	
Land use change				
Emissions per capita	-1.83	$tCO_2eq.$	▼	
International aviation and shipping				
Emissions per capita	0.93	$tCO_2eq.$	▲	

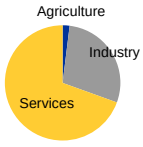
Change in production — **1990 to 2004** — **Change in emissions**



Emissions per sector 2004

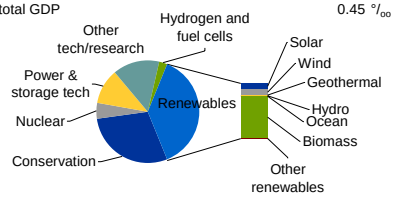


GDP per sector 2004



Energy investment

Total energy research and development 2004	12.3 mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	0.45 °/₀₀	Share (per year) of total GDP	°/₀₀



Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, Annex I
National GHG targets	CO2 emissions from transport to be stabilised at 1990 levels by 2010 Global Long-term GHG emissions target of less than 550 ppm CO2eq by 2050.
Energy related targets	Aims to be independent from oil by 2020. Renewable Electricity Directive provides a target of 60% of electricity consumption from renewable sources by 2010 Biofuels Directive provides indicative target of 5.75% share of biofuels in transport fuel by 2010 for each member state
General climate policies	The Climate Bill (2002). Riksdag decisions on climate policy. Extensive energy efficiency programmes and RES. Strong reliance on energy and carbon taxation
Electricity	EU ETS. Subsidies, grants for conversion to district heating; procurement and investment programmes. Stable emission due to CHP plants.
Industry	EU ETS. Stable CO2 emissions due to high efficiency. Other gases to be regulated under the Environmental Code.
Transport	CO2 emissions from transport to be stabilised at 1990 levels by 2010. Motor-fuels tax. Green cars promotion. Biofuels tax relief. Voluntary agreements with car industry.
Households	Investment grants for energy efficiency; energy labelling of household devices; energy audit. Carbon tax. Decreased emissions due to increased biomass in district heating.
Agriculture	Swedish environment and rural development programme 2000-2006 (LBU). Milk and butter quotas. Reduction of emissions programmes.
Waste	Landfill Ordinance (2001), waste charges and landfill tax. Recovery of landfill gas. Ban on the landfilling of combustible waste.
CDM, JI and IET	CDM projects with non-Annex I countries. Introduction of the 'Linking Directive' to link together the EU ETS and the flexible mechanisms.

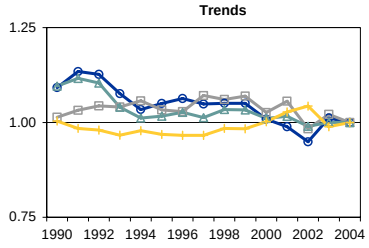
Summary

Economy: Emissions per GDP are very low. Total emissions have decreased since 1990 despite growth in the economy.
Emissions: Emissions per capita are amongst the lowest among industrialised countries due to the high contribution of nuclear and renewables to the energy mix. On track to meet Kyoto targets.
Fuels: Biomass makes up nearly a quarter of the primary energy supply and is encouraged by policies. The electricity systems of the Nordic countries are very interconnected and emissions can depend on the production of hydro electricity and the flow of imported/exported electricity.
Policy: Ambitious target of basing entire energy supply on renewable fuels by 2020. High electricity generation efficiency. Strong reliance on energy and carbon taxation.

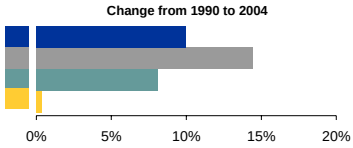
Climate fact sheet — Switzerland

Economy-wide indicators

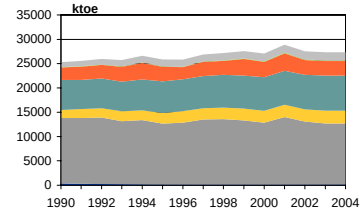
Factors driving emissions (population, GDP, energy and GHG)



	2004		90-04	Meter
Population	7,480	ths people		
GDP (PPP)	224	bln US$ (2000)		
Prm. Energy Sply.(TPES)	27,343	ktoe		
GHG emissions	53	$MtCO_2eq.$		
GHG emissions/GDP PPP	0.236	$kgCO_2eq./US\$$	▼	
TPES/GDP PPP	122	toe/MUS$	▼	
GHG emissions/cap	7.1	$tCO_2eq./cap$	▼	
GDP PPP/cap	30.0	ths US$/cap	▼	
Cum. GHG 1900 to 2004	3.9	$tCO_2eq./cap/y$	▲	



Primary energy supply

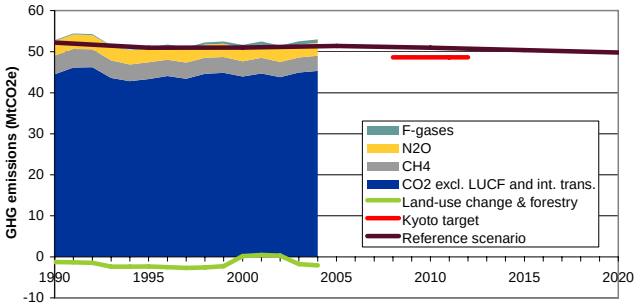


	Share in 2004
Biomass/waste	6.1%
Solar/wind/other	0.1%
Geothermal	0.4%
Hydro	11.0%
Nuclear	26.3%
Gas	9.6%
Oil	46.0%
Coal	0.5%

Emission reduction potential until 2020 below reference scenario

	CO_2 upper	CO_2 lower	CH_4	N_2O	F-gas
$0	$MtCO_2eq$				
	% gas				
	& tot.GHG				
$30	$MtCO_2eq$				
	% gas				
	& tot.GHG				

Historic and projected GHG emissions

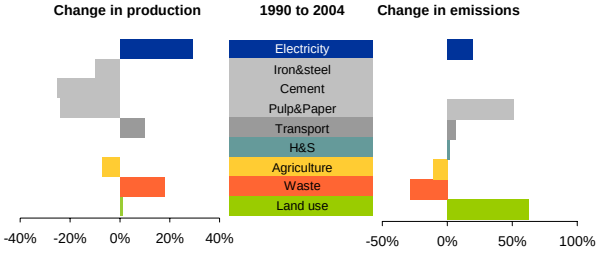


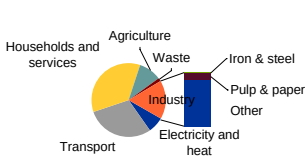
	Share in 2004
F-Gases	2%
N_2O	6%
CH_4	7%
CO_2 excluding LUCF	85%

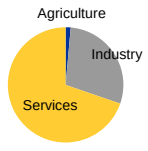
Kyoto target (KT)	-8.0%
Current CO_2 (90-04)	1.8%
Current non-CO_2 (90/95-04)	-7.6%
Current total GHGs (90/95-04)	0.3%
Difference with KT	8.3%

Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity	0.030	$kgCO_2$ per kWh	▲	
Share of ren. energy (RES)	18%		▲	
Incr. of RE over 1990-2004	3%			
Access to electricity	100%			
Industry				
Energy efficiency index	1.5			
Emissions per t steel	0.2	tCO_2 per t steel		
Emissions per t cement		tCO_2 per t cement		
Emissions per t pulp&paper	4.1	tCO_2 per t pulp&paper		
Transport				
Emissions per capita	2.09	$tCO_2eq.$	▼	
Household & services				
Emissions per capita	2.49	$tCO_2eq.$	▼	
Agriculture				
Emissions per capita	0.72	$tCO_2eq.$	▼	
Waste				
Emissions per capita	0.10	$tCO_2eq.$	▼	
Land use change				
Emissions per capita	-0.28	$tCO_2eq.$	▲	
International aviation and shipping				
Emissions per capita	0.46	$tCO_2eq.$	▲	

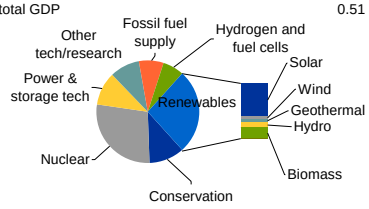






Energy investment

Total energy research and development 2004	16.6 mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	0.51 °/₀₀	Share (per year) of total GDP	°/₀₀



Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, Annex I
National GHG targets	Transport fuels' emissions to be reduced by 8% by 2010. Emissions from heating/process fuels are to be lowered by 15% by 2010.
Energy related targets	Energy efficiency, reduce consumption of fossil fuels by 10% by 2010.
General climate policies	Federal Act on the Protection of the Environment 2003, Sustainable Development Strategy 2002, Act on reduction of CO2 Emissions 2000.
Electricity	The SwissEnergy Programme (2001) with focus on voluntary agreements and partnerships. No nuclear. Maintain current hydro capacity.
Industry	Companies taking on ambitious caps can be exempted from the CO2 tax. Voluntary agreements on energy use efficiency and CO2 emissions under the CO2 Law, collaboration under the SwissEnergy Programme and 'Energy2000' programme. Creation of the private Energy Agency of Trade and Industry.
Transport	Provisional CO2 tax on fuels. Climate levy on motor fuels until 2007. Transport fuels' emissions to be reduced by 8% by 2010. Voluntary agreements with association of car importers. Support for biofuels. Efficiency labels on cars and tax exemption of efficient cars.
Households	CO2 tax on heating fuels. Emissions from heating/process fuels are to be lowered by 15% by 2010.
Agriculture	Federal Law on Agriculture and Federal Law on Water Protection. Introduction of non-product-related direct payments (decoupling of prices and incomes policy).
Waste	Waste Disposal Tax; prohibition of landfilling of combustible waste. 40% energy from waste plants re-used in district heating and elecricity generation.
CDM, JI and IET	No budget allocated for CDM/JI projects for now.

Summary

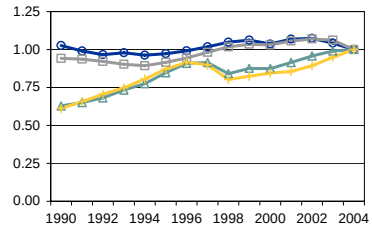
Economy: Relatively low growth in GDP. High GDP/cap.
Emissions: Stable total emissions. Per capita emissions significantly less than the Annex 1 average, due mainly to the fuel mix for electricity generation.
Fuels: Slow growth in primary energy supply and very limited fuel switching.
Policy: Comprehensive range of policies at national and federal level. Strong commitment to reduce per capita energy consumption in the long term. Focus on transport and industry energy efficiency.

Climate fact sheet — Thailand

Economy-wide indicators

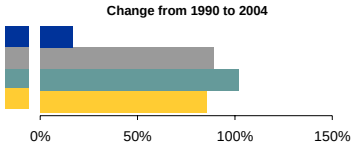
Factors driving emissions (population, GDP, energy and GHG)

Trends



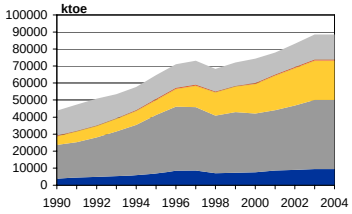
	2004	
Population	63,690	ths people
GDP (PPP)	474	bln US$ (2000)
Prm. Energy Sply.(TPES)	88,574	ktoe
GHG emissions	320	$MtCO_2eq.$
GHG emissions/GDP PPP	0.677	$kgCO_2eq./US$
TPES/GDP PPP	187	toe/MUS$
GHG emissions/cap	5.0	$tCO_2eq./cap$
GDP PPP/cap	7.4	ths US$/cap
Cum. GHG 1900 to 2004	1.2	$tCO_2eq./cap/y$

Change from 1990 to 2004



	90-04	Meter
GHG emissions/GDP PPP	▼	
TPES/GDP PPP	▲	
GHG emissions/cap	▲	
GDP PPP/cap	▲	
Cum. GHG 1900 to 2004	▲	

Primary energy supply

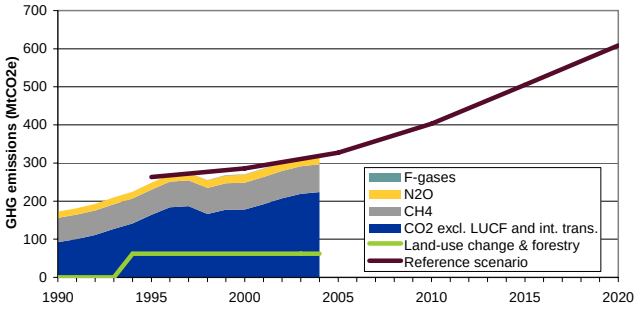


	Share in 2004
Biomass/waste	16.6%
Solar/wind/other	0.0%
Geothermal	
Hydro	0.7%
Nuclear	
Gas	26.3%
Oil	45.9%
Coal	10.6%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_20	F-gas
$0	$MtCO_2eq$					
	% gas					
	& tot.GHG					
$30	$MtCO_2eq$					
	% gas					
	& tot.GHG					

Historic and projected GHG emissions



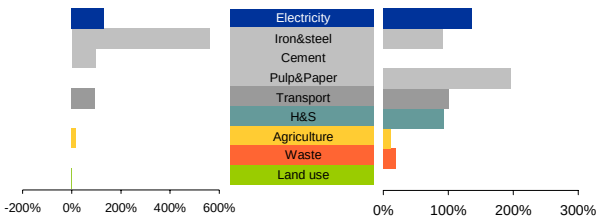
	Share in 2004
F-Gases	1%
N_2O	7%
CH_4	23%
CO_2 excluding LUCF	70%

Current CO_2 (90-04)	142.5%
Current non-CO_2 (90/95-04)	20.2%
Current total GHGs (90/95-04)	85.5%

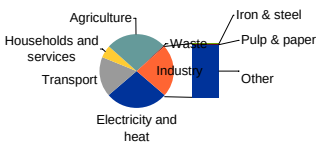
Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity	0.528	$kgCO_2$ per kWh	▼	
Share of ren. energy (RES)	17%		▼	
Incr. of RE over 1990-2004	-17%			
Access to electricity	82%			
Industry				
Energy efficiency index	1.5			
Emissions per t steel	0.3	tCO_2 per t steel		
Emissions per t cement		tCO_2 per t cement		
Emissions per t pulp&paper	0.8	tCO_2 per t pulp&paper		
Transport				
Emissions per capita	0.88	$tCO_2eq.$	▲	
Household & services				
Emissions per capita	0.28	$tCO_2eq.$	▲	
Agriculture				
Emissions per capita	1.33	$tCO_2eq.$	▼	
Waste				
Emissions per capita	0.02	$tCO_2eq.$	▲	
Land use change				
Emissions per capita	0.97	$tCO_2eq.$		
International aviation and shipping				
Emissions per capita	0.23	$tCO_2eq.$	▲	

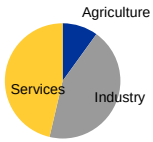
Change in production — **1990 to 2004** — **Change in emissions**



Emissions per sector 2004



GDP per sector 2004



Energy investment

Total energy research and development 2004	mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	°/₀₀	Share (per year) of total GDP	°/₀₀

Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, G77 & China
National GHG targets	
Energy related targets	Set minimum share of solar in electricity production.
General climate policies	Policy and Prospective Plan for Enhancement and Conservation of National Environmental Quality. 5-year National Economic and Social Development Plans (NESDP). Creation of the National Climate Change Committee (NCCC) and of a Climate Change Expert Committee (CCEC). Strong reliance on energy and carbon taxation.
Electricity	Developed energy efficiency under the NESDP. Set minimum share of solar in electricity production. Reduce energy consumption. Energy Conservation and Promotion Act.
Industry	Demand side management programme (DSM). Energy Conservation Programme. Mandatory energy audits. "Divide Energy by 2" programme.
Transport	Use of gas/LPG on public buses and taxis. Energy conservation programme.
Households	Energy efficient appliances campaign.
Agriculture	Land and livestock management plans proposed. Afforestation programme.
Waste	Recycling and CH4 capture from landfills proposed.
CDM, JI and IET	Actively participates in AIJ projects. Several Bi/multilateral agreements in place. CDM being considered.

Summary

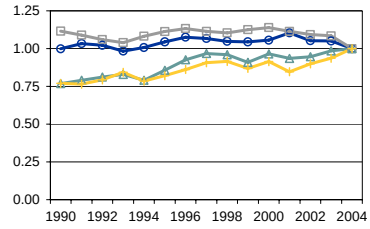
Economy: High GDP growth since 1990, but higher emissions growth.
Emissions: Emissions per capita are higher than the non-Annex 1 average and, after a steep increase in the early 1990s, have been increasing steadily over the period.
Fuels: Biomass fuels make a significant contribution to primary energy supply and gas is replacing oil in the fuel mix.
Policy: Member of the Kyoto Protocol. Actively participates in AIJ projects. Energy efficiency and solar electricity production encouraged.

Climate fact sheet — Turkey

Economy-wide indicators

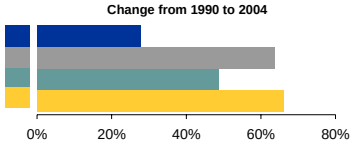
Factors driving emissions (population, GDP, energy and GHG)

Trends

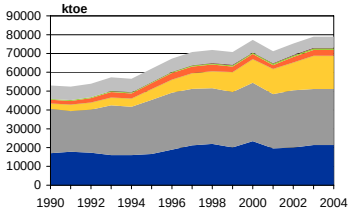


	2004		90-04	Meter
Population	71,790	ths people		
GDP (PPP)	511	bln US$ (2000)		
Prm. Energy Sply.(TPES)	78,905	ktoe		
GHG emissions	304	$MtCO_2eq.$		
GHG emissions/GDP PPP	0.595	$kgCO_2eq./US$	▲	
TPES/GDP PPP	154	toe/MUS$	▼	
GHG emissions/cap	4.2	$tCO_2eq./cap$	▲	
GDP PPP/cap	7.1	ths US$/cap	▲	
Cum. GHG 1900 to 2004	0.9	$tCO_2eq./cap/y$	▲	

Change from 1990 to 2004



Primary energy supply

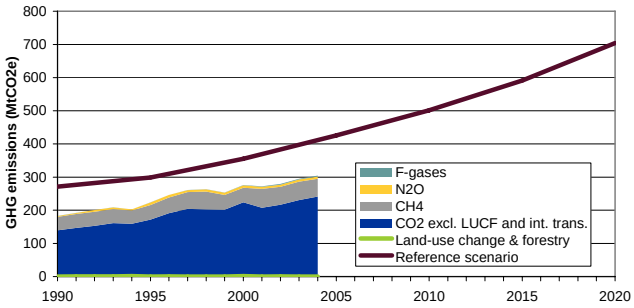


	Share in 2004
Biomass/waste	7.3%
Solar/wind/other	0.5%
Geothermal	1.1%
Hydro	3.9%
Nuclear	
Gas	22.5%
Oil	37.7%
Coal	27.1%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_20	F-gas
$0	$MtCO_2eq$			23	1	0
	% gas			17%	1%	15%
	& tot.GHG			3%	0%	0%
$30	$MtCO_2eq$			34	1	1
	% gas			25%	2%	29%
	& tot.GHG			5%	0%	0%

Historic and projected GHG emissions

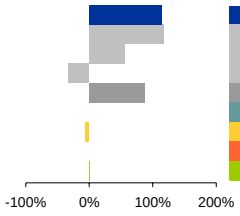


	Share in 2004
F-Gases	1%
N_2O	2%
CH_4	18%
CO_2 excluding LUCF	79%
Current CO_2 (90-04)	72.8%
Current non-CO_2 (90/95-04)	44.9%
Current total GHGs (90/95-04)	66.2%

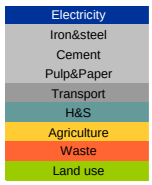
Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity	0.496	$kgCO_2$ per kWh	▼	
Share of ren. energy (RES)	13%		▼	
Incr. of RE over 1990-2004	-5%			
Access to electricity	95%			
Industry				
Energy efficiency index	1.3			
Emissions per t steel	0.3	tCO_2 per t steel		
Emissions per t cement	0.8	tCO_2 per t cement		
Emissions per t pulp&paper	3.6	tCO_2 per t pulp&paper		
Transport				
Emissions per capita	0.57	$tCO_2eq.$	▲	
Household & services				
Emissions per capita	0.56	$tCO_2eq.$	▼	
Agriculture				
Emissions per capita	0.20	$tCO_2eq.$	▼	
Waste				
Emissions per capita	0.50	$tCO_2eq.$	▲	
Land use change				
Emissions per capita	0.00	$tCO_2eq.$	▲	
International aviation and shipping				
Emissions per capita	0.09	$tCO_2eq.$	▲	

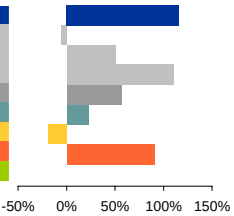
Change in production



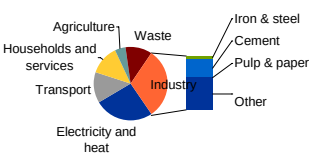
1990 to 2004



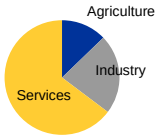
Change in emissions



Emissions per sector 2004

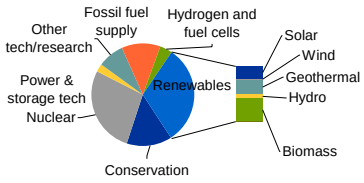


GDP per sector 2004



Energy investment

Total energy research and development 2004	1.5 mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	0.00 °/₀₀	Share (per year) of total GDP	°/₀₀



Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Annex I
National GHG targets	
Energy related targets	
General climate policies	Focus on capacity building and awareness raising. Very few climate change policies in place but working towards policy formulation and eventual harmonisation with EU policies.
Electricity	New law in 2006 to guarantee renewable electricity access to the grid.
Industry	Studies into energy efficiency potential required. Efforts ongoing to increase stakeholder engagement.
Transport	
Households	
Agriculture	
Waste	Waste disposal major issue. Various regulations introduced in early 1990s for control of solid, toxic chemical and hazardous wastes.
CDM, JI and IET	Not yet ratified Kyoto Protocol.

Summary

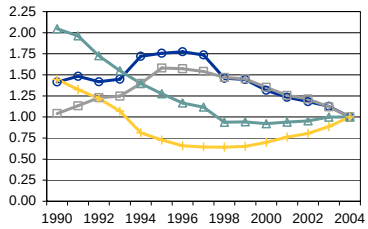
Economy: In 2001, Turkey experienced severe economic contraction but has recovered strongly and over the period 1990-2004 has had GDP growth of more than 50%. Strong link between GDP trend and GHG trend.
Emissions: Per capita emissions are low but increasing and projected growth of emissions is large (more than doubling by 2020). Projections substantially above current trends. HIgh per capita emissions in waste sector.
Fuels: Strong growth in gas consumption.
Policy: Not party to UNFCCC when Kyoto Protocol adopted in 1997 so not in Annex B of Kyoto Protocol and no formal emissions reduction target.
In early stage of negotiations with EU to become member. Preparing initial National Communication for UNFCCC.

Climate fact sheet — Ukraine

Economy-wide indicators

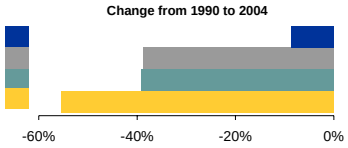
Factors driving emissions (population, GDP, energy and GHG)

Trends



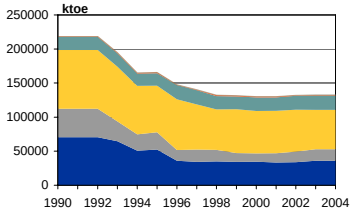
	2004	
Population	47,450	ths people
GDP (PPP)	279	bln US$ (2000)
Prm. Energy Sply.(TPES)	132,980	ktoe
GHG emissions	414	$MtCO_2eq.$
GHG emissions/GDP PPP	1.486	$kgCO_2eq./US$
TPES/GDP PPP	477	toe/MUS$
GHG emissions/cap	8.7	$tCO_2eq./cap$
GDP PPP/cap	5.9	ths US$/cap
Cum. GHG 1900 to 2004	6.4	$tCO_2eq./cap/y$

Change from 1990 to 2004



	90-04	Meter
GHG emissions/GDP PPP	▼	
TPES/GDP PPP	▼	
GHG emissions/cap	▼	
GDP PPP/cap	▼	
Cum. GHG 1900 to 2004	▲	

Primary energy supply

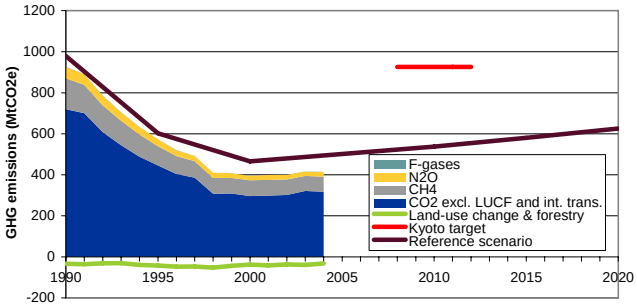


	Share in 2004
Biomass/waste	0.2%
Solar/wind/other	0.0%
Geothermal	
Hydro	0.6%
Nuclear	16.0%
Gas	43.6%
Oil	12.7%
Coal	27.0%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_20	F-gas
$0	$MtCO_2eq$			35	0	1
	% gas			21%	0%	26%
	& tot.GHG			6%	0%	0%
$30	$MtCO_2eq$			68	0	1
	% gas			40%	0%	57%
	& tot.GHG			11%	0%	0%

Historic and projected GHG emissions



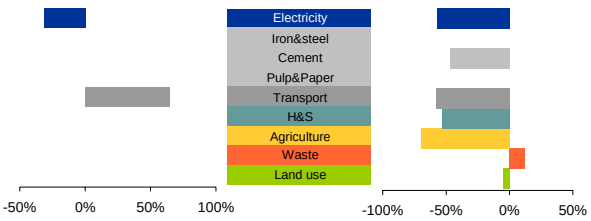
	Share in 2004
F-Gases	0%
N_2O	5%
CH_4	18%
CO_2 excluding LUCF	77%

Kyoto target (KT)	0.0%
Current CO_2 (90-04)	-55.9%
Current non-CO_2 (90/95-04)	-52.9%
Current total GHGs (90/95-04)	-55.3%
Difference with KT	-55.3%

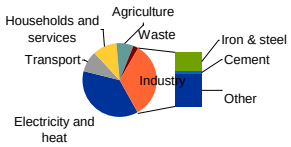
Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity	0.341	$kgCO_2$ per kWh		
Share of ren. energy (RES)	1%		▲	
Incr. of RE over 1990-2004	0%			
Access to electricity				
Industry				
Energy efficiency index	1.8			
Emissions per t steel	1.2	tCO_2 per t steel		
Emissions per t cement	0.8	tCO_2 per t cement		
Emissions per t pulp&paper	0.0	tCO_2 per t pulp&paper		
Transport				
Emissions per capita	0.79	$tCO_2eq.$	▼	
Household & services				
Emissions per capita	0.94	$tCO_2eq.$	▼	
Agriculture				
Emissions per capita	0.64	$tCO_2eq.$	▼	
Waste				
Emissions per capita	0.19	$tCO_2eq.$	▲	
Land use change				
Emissions per capita	-0.68	$tCO_2eq.$	▲	
International aviation and shipping				
Emissions per capita	0.00	$tCO_2eq.$	▲	

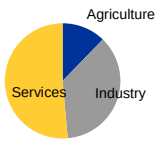
Change in production 1990 to 2004 Change in emissions



Emissions per sector 2004



GDP per sector 2004



Energy investment

Total energy research and development 2004	mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	°/oo	Share (per year) of total GDP	°/oo

Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, Annex I
National GHG targets	
Energy related targets	
General climate policies	National Plan of Implementation of Kyoto Protocol (2005). Implementation of a domestic emission trading scheme considered. Five energy programs in place, including (i) the Complex Programme for Energy Savings (1997 and 2000) scoping regional and sectoral programmes and (ii) the RES development Programme (1997)
Electricity	Improvement of the quality of coal, implementation of the clean technology for utilisation of low quality solid fuels. Improvement of the technical status of the transmission grid and improvement of the grid operation, development and implementation of RES and CHP.
Industry	Quite a complex set of policy assumptions and legal acts aiming at energy efficiency and energy savings.
Transport	Road transport: Improvement efficiency of engines, biofuels, improvement of quality of the roads, optimisation of routs Railway transport: Increase of average load factor, increasing share of electrification, optimisation of routes
Households	Measures of a very short pay-back period may result in 10-15% savings. Measures of longer pay-back time or those that should be subsidised may result in up to 35% savings.
Agriculture	No special programme and measures specified for agriculture
Waste	Solid Waste Treatment programme (2004). Implementation of the programme planned until 2011.
CDM, JI and IET	Interested in implementing JI projects also to finance projects of relatively low IRR. Potential of €15 bn in JI projects involving 80 Mt CO2 eq.

Summary

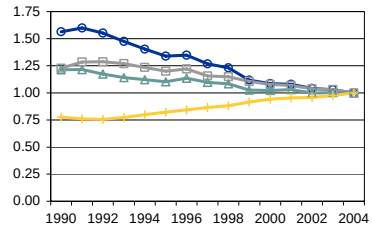
Economy: Significant decrease in GDP and GDP per capita since 1990, though GDP per capita has been increasing again since 1999. Very high GHG/GDP.
Emissions: Emissions have decreased by more than 50% since 1990, due to the economic collapse. Projections significantly above current trends.
Fuels: In recent years, although still relatively small the proportion of oil in primary energy supply has increased at the expense of gas.
Policy: Emissions well below Kyoto target. JI is seen as a big opportunity to gain finance for projects. Considering implementing internal emissions trading and are developing a national allocation plan

Climate fact sheet — United Kingdom

Economy-wide indicators

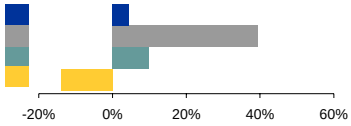
Factors driving emissions (population, GDP, energy and GHG)

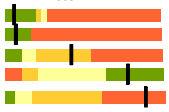
Trends



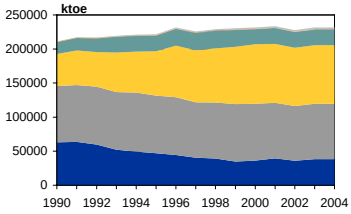
	2004		90-04	Meter
Population	59,840	ths people		
GDP (PPP)	1,696	bln US$ (2000)		
Prm. Energy Sply.(TPES)	231,769	ktoe		
GHG emissions	656	$MtCO_2eq.$		
GHG emissions/GDP PPP	0.387	$kgCO_2eq./US$	▼	
TPES/GDP PPP	137	toe/MUS$	▼	
GHG emissions/cap	11.0	$tCO_2eq./cap$	▼	
GDP PPP/cap	28.3	ths US$/cap	▲	
Cum. GHG 1900 to 2004	11.2	$tCO_2eq./cap/y$	▼	

Change from 1990 to 2004





Primary energy supply

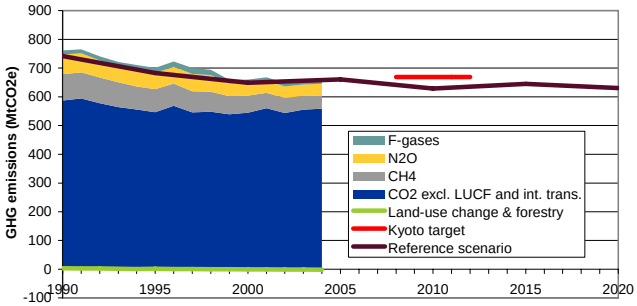


	Share in 2004
Biomass/waste	1.2%
Solar/wind/other	0.1%
Geothermal	0.0%
Hydro	0.1%
Nuclear	10.0%
Gas	37.0%
Oil	35.1%
Coal	16.5%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_2O	F-gas
$0	$MtCO_2eq$					
	% gas					
	& tot.GHG					
$30	$MtCO_2eq$	18	18			
	% gas	3%	3%			
	& tot.GHG	3%	3%			

Historic and projected GHG emissions



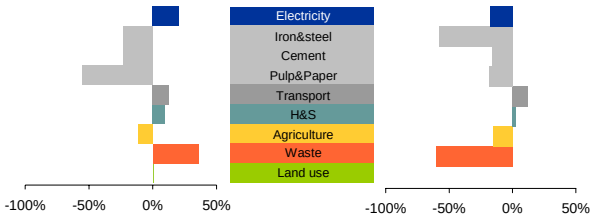
	Share in 2004
F-Gases	2%
N_2O	6%
CH_4	7%
CO_2 excluding LUCF	85%

Kyoto target (KT)	-12.5%
Current CO_2 (90-04)	-4.8%
Current non-CO_2 (90/95-04)	-45.3%
Current total GHGs (90/95-04)	-14.2%
Difference with KT	-1.7%

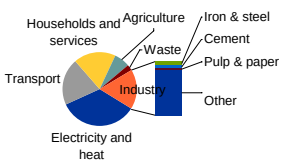
Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity	0.473	$kgCO_2$ per kWh	▼	
Share of ren. energy (RES)	1%		▲	
Incr. of RE over 1990-2004	1%			
Access to electricity	100%			
Industry				
Energy efficiency index	1.9			
Emissions per t steel	0.6	tCO_2 per t steel		
Emissions per t cement	0.6	tCO_2 per t cement		
Emissions per t pulp&paper	9.5	tCO_2 per t pulp&paper		
Transport				
Emissions per capita	2.24	$tCO_2eq.$	▲	
Household & services				
Emissions per capita	2.00	$tCO_2eq.$	▼	
Agriculture				
Emissions per capita	0.76	$tCO_2eq.$	▼	
Waste				
Emissions per capita	0.28	$tCO_2eq.$	▼	
Land use change				
Emissions per capita	-0.03	$tCO_2eq.$	▼	
International aviation and shipping				
Emissions per capita	0.66	$tCO_2eq.$	▲	

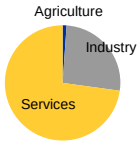
Change in production — **1990 to 2004** — **Change in emissions**



Emissions per sector 2004

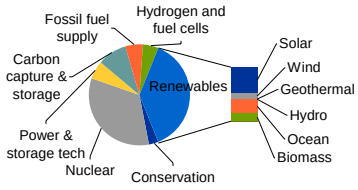


GDP per sector 2004



Energy investment

Total energy research and development 2004	5.0 mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	0.05 °/₀₀	Share (per year) of total GDP	°/₀₀



Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, Annex I, Gleneagles dialogue
National GHG targets	Medium term target of 20% CO2 reduction (compared to 1990) by 2010. 60% CO2 reduction by 2050 (voluntary target, but legislation is pending to make this a binding target)
Energy related targets	Obligation on electricity suppliers to supply target percentage of elec from renewable sources each year. The target for 2006/07 is 6.7%, rising to 15.4% by 2015/16 Renewable Electricity Directive provides a target of 10% of electricity consumption from renewable sources by 2010 5% of road fuels to come from renewable sources by 2010 (Road Transport Fuel Obligation). Biofuels Directive provides indicative target of 5.75% share of biofuels in transport fuel by 2010 for each member state Indicative target of 10GW of installed CHP capacity by 2010
General climate policies	Climate Change Programme 2006. Climate Change Levy on fuel use (including elec) for industry. Carbon Trust organisation set up to stimulate carbon reduction in business. National ETS piloted in 2002.
Electricity	EU ETS. Obligation on electricity suppliers to supply target percentage of elec from renewable sources each year. Linked to tradable certificates.
Industry	EU ETS. Reduced rate of Climate Change Levy if negotiated Climate Change Agreement energy efficiency or emissions targets are met.
Transport	Renewable transport fuel obligation on fuel suppliers to start April 2008. Biofuels tax exemption. Energy Saving Trust role to stimulate emissions reduction from transport.
Households	Energy Saving Trust role to stimulate emissions reduction from domestic sector. Commitment on electricity suppliers to increase energy efficiency in homes.
Agriculture	Woodlands Grant Scheme, woodland planting, Strategy for non-food crops.
Waste	Waste Resources Action Programme - organisation set up. Local Authority landfill trading scheme to meet target levels of waste to landfill.
CDM, JI and IET	No intention to use CDM/JI to achieve Kyoto Target.

Summary

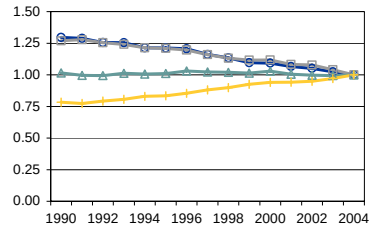
Economy: Strong growth in GDP, with smaller increase in primary energy consumption and a decrease in emissions. GDP per capita is higher than Annex 1 average.
Emissions: Emission rates per capita average for industrialised countries and decreasing.
Fuels: Fuel switching in the early 1990s has lead to a high share of natural gas. There is a relatively small share of renewable energy.
Policy: Emissions already below Kyoto target, partly due to "dash for gas" since 1990 base year, but emissions have increased in recent years and are expected to rise further. Expected to meet Kyoto but miss national 2010 CO2 target. Proactive in taking national measures and driving the international debate. Preference for market-based mechanisms and obligations (UK ETS, Renewable Obligation, Renewable Transport Fuel Obligation, Landfill Allowance Trading Scheme, etc.)
Some innovative climate change policies such as establishment of Carbon Trust.

Climate fact sheet — United States of America

Economy-wide indicators

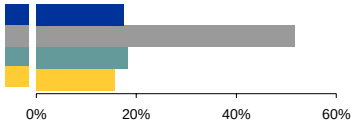
Factors driving emissions (population, GDP, energy and GHG)

Trends

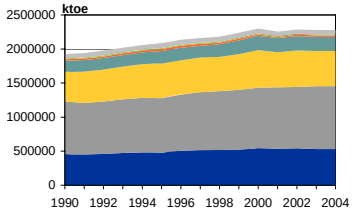


	2004		90-04	Meter
Population	293,950	ths people		
GDP (PPP)	10,708	bln US$ (2000)		
Prm. Energy Sply.(TPES)	2,280,239	ktoe		
GHG emissions	7,065	$MtCO_2eq.$		
GHG emissions/GDP PPP	0.660	$kgCO_2eq./US\$$	▼	
TPES/GDP PPP	213	toe/MUS$	▼	
GHG emissions/cap	24.0	$tCO_2eq./cap$	▼	
GDP PPP/cap	36.4	ths US$/cap	▲	
Cum. GHG 1900 to 2004	12.7	$tCO_2eq./cap/y$	▼	

Change from 1990 to 2004



Primary energy supply

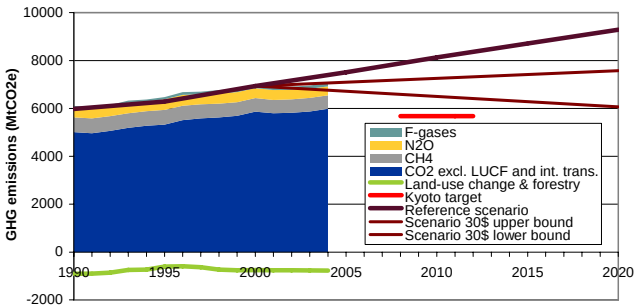


	Share in 2004
Biomass/waste	3.0%
Solar/wind/other	0.1%
Geothermal	0.4%
Hydro	1.1%
Nuclear	9.0%
Gas	22.8%
Oil	40.4%
Coal	23.3%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_2O	F-gas
$0	$MtCO_2eq$			70	40	59
	% gas			10%	10%	14%
	& tot.GHG			1%	0%	1%
$30	$MtCO_2eq$	2822	1307	173	78	158
	% gas	36%	17%	26%	19%	38%
	& tot.GHG	30%	14%	2%	1%	2%

Historic and projected GHG emissions



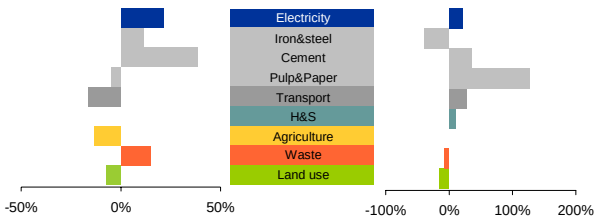
	Share in 2004
F-Gases	2%
N_2O	5%
CH_4	8%
CO_2 excluding LUCF	85%

Kyoto target (KT)	-7.0%
Current CO_2 (90-04)	19.6%
Current non-CO_2 (90/95-04)	-2.3%
Current total GHGs (90/95-04)	15.7%
Difference with KT	22.7%

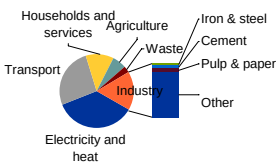
Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity	0.575	$kgCO_2$ per kWh	▲	
Share of ren. energy (RES)	5%		▼	
Incr. of RE over 1990-2004	-1%			
Access to electricity	100%			
Industry				
Energy efficiency index	1.6			
Emissions per t steel	0.4	tCO_2 per t steel		
Emissions per t cement	0.8	tCO_2 per t cement		
Emissions per t pulp&paper	1.2	tCO_2 per t pulp&paper		
Transport				
Emissions per capita	6.36	$tCO_2eq.$	▲	
Household & services				
Emissions per capita	2.91	$tCO_2eq.$	▼	
Agriculture				
Emissions per capita	1.50	$tCO_2eq.$	▼	
Waste				
Emissions per capita	0.66	$tCO_2eq.$	▼	
Land use change				
Emissions per capita	-2.63	$tCO_2eq.$	▼	
International aviation and shipping				
Emissions per capita	0.32	$tCO_2eq.$	▼	

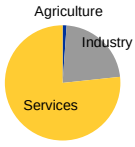
Change in production — **1990 to 2004** — **Change in emissions**



Emissions per sector 2004

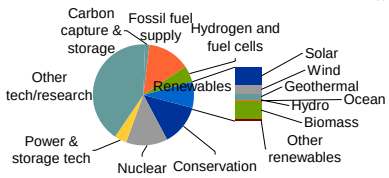


GDP per sector 2004



Energy investment

Total energy research and development 2004	172.8 mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	0.28 °/₀₀	Share (per year) of total GDP	°/₀₀



Policies affecting greenhouse gas emissions

Member to climate agreements or groups	UNFCCC, Annex I, Gleneagles dialogue, AP6
National GHG targets	National target of improving emissions per GDP by 18% from 2002 to 2012 which results in roughly 20% increase of absolute emissions above 1990 levels. 28 states developed voluntary targets. California's reduction target is -11% by 2010 from 2000 levels, and -80% by 2050 from 1990 levels.
Energy related targets	Renewable Portfolio Standards - minimum targets for renewable electricity - in many states. Under the Mandatory Renewable Fuel Standard, fuel blenders must use 7.5 billion gallons of renewable fuels in 2012 Proposed mandatory RFS target for 2017 is 35 billion gallons of renewable and alternative fuels proposed target of reducing gasoline usage by 20% by 2017
General climate policies	Limited mandatory programmes on federal level. R&D programmes and international cooperation on climate science, carbon capture and storage, hydrogen and emission reductions from methane. Activities at state level (climate action plans, emission trading systems, renewable portfolio standards, greenhouse gas standards for vehicles), independent of federal action.
Electricity	Renewable Portfolio Standards - minimum targets for renewable electricity - in many states. Strong development programme for clean technologies.
Industry	Voluntary partnerships between Government and industry, NGOs and industry to reduce emissions. Climate Wise and Industry for the Future programmes.
Transport	DOE's R&D grants for clean fuels and vehicle efficiency. Voluntary initiatives to reduce emissions between Government and automotive industry
Households	Extensive programmes for increased building efficiency (Energy-Star label) and energy saving appliances. Tax incentives to residential solar systems.
Agriculture	AgStar & Ruminant Livestock Efficiency programme to reduce CH4 production. Many conservation programmes to manage fertilisers use and soil productivity.
Waste	Landfill Rule: Mandatory capture and combustion of gases in selected landfills. Other landfills are encouraged to capture and burn CH4.
CDM, JI and IET	Rejected the Kyoto Protocol, so cannot utlise Kyoto Mechanisms.

Summary

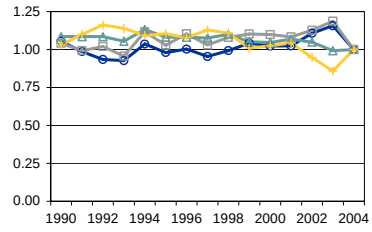
Economy: GDP has increased substantially faster than population, primary energy supply and emissions. GHG/GDP very closely tracks TPES/GDP
Emissions: Country with highest absolute emissions. Emission rates per capita are among the highest globally. Greenhouse gas and primary energy supply intensities have decreased steadily over the period 1990 to 2004.
Fuels: There is a strong reliance on coal and gas and very little fuel switching since 1990.
Policy: Not ratified Kyoto Protocol. Kyoto target would be out of reach, national targets are significantly less ambitious.
National strategy (climate technology R&D funds) aimed mostly at long-term emissions reductions.
Pressure on federal government from local and state governments and some businesses to take action and strengthen policies.

Climate fact sheet — Venezuela

Economy-wide indicators

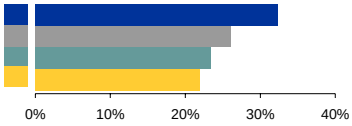
Factors driving emissions (population, GDP, energy and GHG)

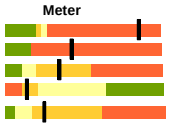
Trends



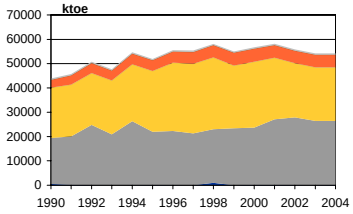
	2004		90-04	Meter
Population	26,130	ths people		
GDP (PPP)	145	bln US$ (2000)		
Prm. Energy Sply.(TPES)	54,227	ktoe		
GHG emissions	237	$MtCO_2eq.$		
GHG emissions/GDP PPP	1.633	$kgCO_2eq./US$	▼	
TPES/GDP PPP	374	toe/MUS$	▼	
GHG emissions/cap	9.1	$tCO_2eq./cap$	▼	
GDP PPP/cap	5.6	ths US$/cap	▼	
Cum. GHG 1900 to 2004	3.2	$tCO_2eq./cap/y$	▲	

Change from 1990 to 2004





Primary energy supply

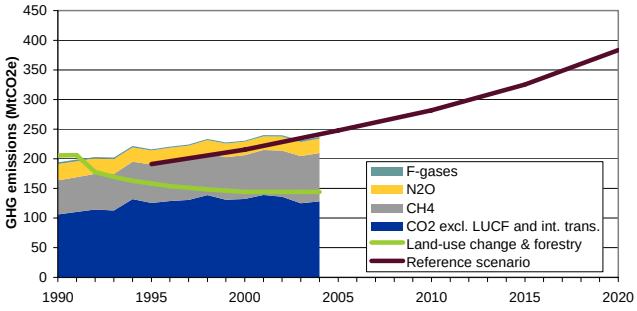


	Share in 2004
Biomass/waste	1.0%
Solar/wind/other	
Geothermal	
Hydro	9.6%
Nuclear	
Gas	40.7%
Oil	48.6%
Coal	0.1%

Emission reduction potential until 2020 below reference scenario

		CO_2 upper	CO_2 lower	CH_4	N_2O	F-gas
$0	$MtCO_2eq$					
	% gas					
	& tot.GHG					
$30	$MtCO_2eq$					
	% gas					
	& tot.GHG					

Historic and projected GHG emissions



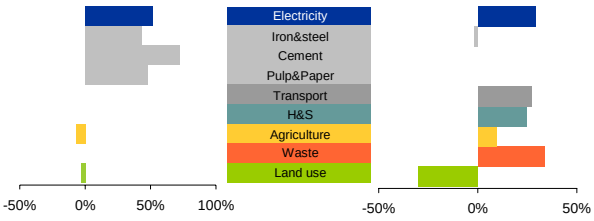
	Share in 2004
F-Gases	1%
N_2O	10%
CH_4	35%
CO_2 excluding LUCF	54%

Current CO_2 (90-04)	20.4%
Current non-CO_2 (90/95-04)	25.4%
Current total GHGs (90/95-04)	22.6%

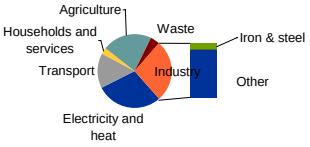
Sectoral indicators

	2004		90-04	Meter
Electricity				
Emissions intensity	0.245	$kgCO_2$ per kWh	▼	
Share of ren. energy (RES)	11%		▲	
Incr. of RE over 1990-2004	2%			
Access to electricity	94%			
Industry				
Energy efficiency index	1.9			
Emissions per t steel	1.7	tCO_2 per t steel		
Emissions per t cement		tCO_2 per t cement		
Emissions per t pulp&paper	0.0	tCO_2 per t pulp&paper		
Transport				
Emissions per capita	1.39	$tCO_2eq.$	▼	
Household & services				
Emissions per capita	0.26	$tCO_2eq.$	▼	
Agriculture				
Emissions per capita	1.95	$tCO_2eq.$	▼	
Waste				
Emissions per capita	0.38	$tCO_2eq.$	▲	
Land use change				
Emissions per capita	5.52	$tCO_2eq.$	▼	
International aviation and shipping				
Emissions per capita	0.16	$tCO_2eq.$	▲	

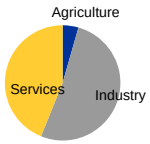
Change in production 1990 to 2004 Change in emissions



Emissions per sector 2004



GDP per sector 2004



Energy investment

Total energy research and development 2004	mln US$ (2005)	**Energy infrastructure investments 2001 to 2010**	mln US$ (2000)
Share of total GDP	°/₀₀	Share (per year) of total GDP	°/₀₀

Policies affecting greenhouse gas emissions

Member to climate agreements or groups	Kyoto Protocol, UNFCCC, G77 & China, OPEC
National GHG targets	
Energy related targets	
General climate policies	Economic and Social Sustainable Plan. General Strategy for Climate Change. National Action Plan of Biodiversity Convention.
Electricity	Switch to gas in power production and reduce dependence on oil. Promotion of R&D partnerships and technical transfer
Industry	Energy efficiency programme. Enhance technology transfer and switch high energy users to gas.
Transport	Energy conservation campaigns.
Households	Energy and water conservation campaigns.
Agriculture	Soil conservation programme. Water sanitation and river management programmes. Programme against desertification.
Waste	Voluntary waste recycling
CDM, JI and IET	Already participates in a number of agreements (e.g. CAF). CDM considered.

Summary

Economy: Both GDP and population have increased significantly since 1990 although there was a period of recession in 2002-2003. GDP per capita has remained almost constant at a relatively low level. GHG per GDP is high. Oil is a very important contributor to the economy
Emissions: In spite of GDP growth of about 25%, GHG emissions have decreased withalmost 10%. GHG emissions per capita and per GDP have strongly decreased. Land use change and forestry large net source of emissions. Emissions in the electricity sector have strongly decreased, while production has strongly grown. Per capita emissions in agriculture and land use change are high.
Fuel: Oil makes up nearly half the energy supply, gas is responsible for most of the remaining energy consumtpion.
Policy: Limited policies in place. Biggest source of emissions is the oil and gas production sector which have more targeted policies.

Table 18. Data sources used in the fact sheets

Indicator	Unit	Source
Population	thousand people	United Nations world population prospects (UN 2006)
GDP	Billion US$(2000)/yr	World Bank, World Development Indicators (World Bank 2006), downloaded 24 August 2006 Dollar figures for GDP are converted from domestic currencies using single year official exchange rates.
GDP PPP	Billion US$(2000)/y	World Bank, World Development Indicators (World Bank 2006), downloaded 24 August 2006 Dollar figures for GDP are converted from domestic currencies using purchase power parities.
GHG emissions	$MtCO_2eq.$	Data were taken from the following hierarchy of sources: 1. National submissions to the UNFCCC as collected by the UNFCCC secretariat and published in the GHG emission database available at their web site. For Annex I countries the latest available year is usually 2004. Most non-Annex I countries report only or until 1994 (UNFCCC 2005) 2. CO_2 emissions from fuel combustion as published by the International Energy Agency. The latest available year is 2004 (IEA 2006). If this dataset was chosen for industry, process CO_2 emissions from cement production from CDIAC 2005 were added. 3. Emissions from Land-use change as published by Houghton in the WRI climate indicator analysis tool (Houghton 2003) 4. Emissions from CH_4 and N_2O as estimated by the US Environmental Protection Agency. Latest available year is 2005 (USEPA 2006a) 5. CO_2, CH_4, N_2O, HFC, PFC and SF_6 emissions from the EDGAR database version 3.2 available for 1990 and 1995 (Olivier and Berdowski 2001) By country, by gas and by sector, the absolute values from the data source highest in the hierarchy were chosen and extended to other years by the growth rates from sources lower in the hierarchy if available. Sector definitions are those used for UNFCCC reporting, except that "electricity and heat" also includes fugitive emissions, "industry" includes energy and process emissions as well as solvents.
Cumulative greenhouse gas emissions	$MtCO_2eq./cap/year$	GHG emissions from above (usually available as of 1990, for IEA 2006 for some countries as of 1970) backwards extrapolated to 1900 using the regional growth rates per gas and sector of the EDGAR-HYDE 1.4 database (Van Aardenne et al. 2001), summed from 1990 to 2004 for all Kyoto Gases using GWPs as used under the Kyoto Protocol and divided by population of the year 2004 and divided by the number of years in the sum (105)
Projected GHG emissions	$MtCO_2eq.$	CO_2 projections were derived from the following hierarchy of sources (see also Table 19): 1. Latest National Communication available at the UNFCCC web site (UNFCCC 2006). 2. Growth rates from the respective regions of the World energy outlook 2005 of the International Energy Agency (IEA 2004), provided in Table 20. Projections from non CO_2 emissions are taken from USEPA 2006a.
Total primary energy supply	EJ	IEA energy balances (IEA 2005b)
Emission reduction potential	$MtCO_2eq.$ using a $/t$CO_2$eq. scale, with constant year 2000 US dollars	CO_2: Individual sources, see Table 21. Non-CO_2: US EPA, Global Mitigation of non-CO_2 Greenhouse Gases (USEPA 2006b) In this analysis, one discount rate is calculated: 10% (with a 40% tax rate). Each value at $0 and $30 represents the absolute reductions compared to the reference baseline for each country.
Electricity production	GWh	IEA energy balances (IEA 2005b)

Indicator	Unit	Source
Share of renewable energy	%	IEA energy balances (IEA 2005b)
Emissions electricity production	$MtCO_2eq.$	Sources see historical GHG emissions above. Includes all emissions from electricity and heat as well as fugitive emissions
Emissions per kWh	$kgCO_2/kWh$	As provided in IEA 2005a
Share of access to electricity	%	Share of population that has access to the electricity grid (IEA 2002b)
Energy efficiency index in industry	no unit	Energy efficiency index aggregated for iron & steel, pulp & paper, cement, petrochemical industry and petroleum refineries as provided by Kuramochi 2006. An indicator of 1 denotes best available technology. A value of 1.2 shows that the country is using 20% more energy than best available technology.
Iron & steel production	Mt	US Geological Survey, available at (USGS 1994-2004). Years 1995-2004: from International Iron and Steel Institute: Iron and Steel Yearbook (IISI 1995-2004)
Emissions iron & steel	$MtCO_2eq.$	IEA emissions from fuel combustion (IEA 2005a), excluding emissions from electricity use
Cement production	Mt	US Geological Survey (USGS 1994-2004), downloaded on 15 August 2006
Emissions cement	$MtCO_2$	Own calculations. CO_2 emissions for cement include combustion emissions as well as process emissions from the calcinations of limestone. Results for non-EU countries have been taken from Höhne et al. (2006b). For individual EU countries, the results for the EU as a whole have been translated from this study to the country level using country-level data on specific fuel consumption and clinker cement ratio. Similar to the approach for the other countries used in Höhne et al. (2006b), this figures have been assumed to stay constant over time, with total CO_2 emissions been driving by the development of total clinker and cement production over time.
Pulp & paper production	Mt/m^3	FAOSTAT (2006), downloaded 15 August 2006
Emissions pulp & paper	$MtCO_2eq.$	IEA emissions from fuel combustion (IEA 2005a), excluding emissions from electricity use
Road Traffic	million vehicle-km	International Road Federation (IRF 2005), Table III-1. Movement of passenger cars, buses, Vans & Pick-ups, Lorries, Motorcycles and mopeds over one kilometre
No. of passenger cars	cars per 1000 people	Development Data Group, World Development Indicators Online (World Bank 2006). Accessed August 2004 Passenger Cars per 1000 People refer to individual four-wheel vehicles. These numbers exclude buses, freight vehicles, and two-wheelers such as mopeds and motorcycles.
Floorspace	m^2	Own calculations based on “Housing Statistics in the European Union 2004”, published in December 2004 by the Czech and Swedish ministries. Data on m² are derived from information on the number of dwellings in the building stock and the (assumed: constant) average size of dwellings in the dwelling stock of the respective countries.

Indicator	Unit	Source
Agricultural production	Net per cap PIN 99-01	FAOSTAT (2006) PIN: Production index number: The FAO indices of agricultural production show the relative level of the aggregate volume of agricultural production for each year in comparison with the base period 1999-2001. They are based on the sum of price-weighted quantities of different agricultural commodities produced after deductions of quantities used as seed and feed weighted in a similar manner. The resulting aggregate represents, therefore, disposable production for any use except as seed and feed. All the indices at the country, regional and world levels are calculated by the Laspeyres formula. Production quantities of each commodity are weighted by 1999-01 average international commodity prices and summed for each year. To obtain the index, the aggregate for a given year is divided by the average aggregate for the base period 1999-01.
Meat consumption per capita	kg meat/cap/yr	FAOSTAT (2006), downloaded 20 June 2006 Estimation per capita meat supplies available for human consumption during the reference period in terms of quantity. Per capita supplies in terms of product weight are derived from the total supplies available for human consumption (meat) by dividing the quantities of meat by the total population actually partaking of the meat supplies during the reference period, i.e. the present in-area (de facto) population within the present geographical boundaries of the country. In other words, nationals living abroad during the reference period are excluded, but foreigners living in the country are included. Adjustments are made wherever possible for part-time presence or absence, such as temporary migrants, tourists and refugees supported by special schemes (if it has not been possible to allow for the amounts provided by such schemes under imports). In almost all cases, the population figures used are the mid-year estimates published by the United Nations Population Division.
Food intake par capita per day	cal/cap/day	FAOSTAT (2006), downloaded at 20 June Calories from Livestock and Fish Primary Equivalent supply. The estimation of total food supplies available for human consumption during the reference period in terms of quantity and, by applying appropriate food composition factors for all primary and processed products, also in terms of caloric value content. Calorie supplies are reported in kilocalories. The traditional unit of calories is being retained for the time being until the proposed kilojoule gains wider acceptance and understanding (1 calorie = 4.19 kilojoules).
Municipal Waste	Mt	OECD Factbook 2006: Economic, Environmental and Social Statistics (OECD 2006)
Land area	1000Ha	FAOSTAT (FAOSTAT 2006), data as of July 2004, downloaded in June 2006. Land Area: total area excluding area under inland water bodies. The definition of inland water bodies generally includes major rivers and lakes.
Total forest area	1000Ha	FAO from Global Forest Resources Assessment 2005 (FRA 2005), downloaded on 21 June 2006. Forest: Land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10 percent, or trees able to reach these thresholds in situ. It does not include land that is predominantly under agricultural or urban land use.

Indicator	Unit	Source
Change of Annual Forest	1000Ha/yr	FAO from Global Forest Resources Assessment 2005 (FRA 2005), downloaded on 21 June 2006. Forest Average Annual Change – Total is the net change in forests and includes expansion of forest plantations and losses and gains in the area of natural forests. Total Forest includes natural forests and forest plantations. The term is used to refer to land with a tree cover of more than 10 percent and area of more than 0.5 ha. Forests are determined both by the presence of trees and the absence of other predominant land uses. The trees should be able to reach a minimum height of 5 m. Young stands that have not yet reached, but are expected to reach, a crown density of 10m percent and tree height of 5 m are included under forest, as are temporarily unstocked areas. The term includes forests used for purposes of production, protection, multiple use or conservation (i.e. forest in national parks, nature reserves and other protected areas), as well as forest stands on agricultural lands (e.g. windbreaks and shelterbelts of trees with a width of more than 20 m) and rubberwood plantations and cork oak stands. The term specifically excludes stands of trees established primarily for agricultural production, for example fruit tree plantations. It also excludes trees planted in agroforestry systems.
Energy R&D	Million US$ (2005 prices and MEX)	World Energy Investment Outlook, 2003 Insights (IEA 2003). Electric Power Conversion R&D related to: turbo-engines, multi-fuel gas turbines, conventional and combined cycles; super-conducting generating machines; magneto-hydrodynamic conversion; heat/electricity combined production; electricity generators and components; dry cooling towers; re-powering, retrofitting, life extensions and upgrading of fossil fuel power plants; thermal pollution from power plants; air pollution from power plants; boiler R&D. Electricity Transmission and Distribution R&D related to: electricity transmission and distribution (e.g. solid state power electronics, load management and control systems, network problems, superconducting cables, AC and DC high voltage cables, HVDC transmission); all high temperature superconducting research. Energy Storage R&D related to: all forms of energy storage, including superconducting magnetic, hot or cool, and kinetic energy storage technologies.
Energy investments	Real billion US$ (2000 prices and MEX)	Estimates of investment requirements are derived from the projections of energy supply and demand of the World Energy Outlook 2002 (IEA 2002b) Reference Scenario. Hence only those government policies and measures that had been enacted as of mid-2002 are taken into account and later or potential policy initiatives (including those aimed at reducing greenhouse gas emissions and energy imports) are not taken into account. Note that supply side investments only are considered. These estimates takes account of projects that have already been decided and expenditures that have already incurred. The convention of attributing capital expenditures to the year in which the plant in question becomes operational has been adopted (ie no attempt has been made to estimate the lead times for each category of project). Investment is defined as capital expenditure only and does not include spending that is usually classified as operation and maintenance.

Table 19. Detailed assumptions on projections of CO_2 emissions

Note: **National Communications** are available on line at http://unfccc.int/national_reports/items/1408.php (UNFCCC 2006)

Country	Assumptions for projections
Argentina	Data for 1994-2000 were derived from IEA 2005a, 2000-2020 data were calculated based on IEA's growth rate for "Other Latin American countries" (where annual growth relates to the 2002-2020 period) (IEA 2004, provided in Table 20)
Australia	4th National Communication page 82

Country	Assumptions for projections
Austria	3rd National Communication
Belarus	1990-2000 data from UNFCCC database. 2005-2020 data based on IEA annual growth for "Other transition economies" (where annual growth relates to the 2002-2020 period) (IEA 2004, provided in Table 20)
Belgium	4th National Communication
Brazil	1995 data based on growth rate between 1990 and 1994. 2000 data from IEA and 2005-2020 data based on IAE annual growth for "Brazil" (where annual growth relates to the 2002-2020 period) (IEA 2004, provided in Table 20)
Bulgaria	4th National Communication
Canada	3rd National Communication
China	1994-2000 data from IEA 2005a, 2000-2020 data based on IEA's growth rate for "China".(IEA 2004, provided in Table 20)
Colombia	1990-1994 data from 1st National Communication, 2000-2020 data based on IEA's growth for "Other Latin American countries" (where annual growth relates to the 2002-2020 period) (IEA 2004, provided in Table 20)
Czech Republic	4th National Communication
Denmark	4th National Communication
Finland	4th National Communication
France	4th National Communication
Germany	1990-2005 data from 3rd National Communication, 2010-2020 data based on Fig 8 (EU Energy Outlook scenario) of the demonstrable progress report
Greece	4th National Communication
Hungary	4th National Communication page 86
India	1994-1995 data from 1st National Communication, 2000 data from IEA 2005a and 2005-2020 data based on IEA's annual growth for "India" (where annual growth relates to the 2002-2020 period) (IEA 2004, provided in Table 20)
Indonesia	1990-1994 data from 1st National Communication, 1995-2020 data based on IEA' s annual growth for "Indonesia" (where annual growth relates to the 2002-2020 period) (IEA 2004, provided in Table 20)
Iran	1990-1994 data from 1st National Communication, 2000-2020 data based on IEA's annual growth for "Middle East" (where annual growth relates to the 2002-2020 period) (IEA 2004, provided in Table 20)
Ireland	1990-2010 data from 3rd National Communication, 2015-2020 data based on 1990-2010 historical growth rate
Italy	3rd National Communication
Japan	1990-2010 from 4th National Communication, 2015-2020 data based on IEA's annual growth rate for "Japan" (where annual growth relates to the 2010-2020 period) (IEA 2004, provided in Table 20)
Kazakhstan	1990-1994 data from 1st National Communication, 1995-2020 data based on growth rates calculated from the "with measures scenario" in box 2, page 57 of the National Communication.
Korea (South)	1990-2001 data from 2nd National Communication, 2005-2020 data from p. 71
Malaysia	1st National Communication.
Mexico	1990-1995 data from 2nd National Communication Annex II, 2000-2005 data based on 6.25% annual growth calculated between 2010 and 1995. 2010 data from 2nd National Communication. 2015-2020 based on IEA's growth rate for "Mexico" (where annual growth relates to the 2010-2020 period) (IEA 2004, provided in Table 20)
Netherlands	4th National Communication
New Zealand	4th National Communication
Nigeria	1994-2000 based on IEA trend in 1994-2000 of -1.4% growth rate, 2000-2020 based on IEA's annual growth for "Africa" (where annual growth relates to the 2002-2020 period). (IEA 2004, provided in Table 20)
Norway	4th National Communication, 2005 and 2015 data are an average of 2000-2010 data and 2010-2020 data respectively.

Country	Assumptions for projections
Papua New Guinea	1994 data from 1st National Communication, 2000-2020 data based on CDIAC historical annual growth between 1995 and 2002 (CDIAC 2005).
Poland	3rd National Communication
Portugal	1990-2010 data from 4th National Communication. 2015 data is an average of years 2010 and 2020, 2020 is an average of high and low scenario.
Russian Federation	1994-2000 data from UNFCCC database because National Communication is unreliable, 2005-2020 data are based on IAE's annual growth for "Russia" (where annual growth relates to the 2002-2020 period) (IEA 2004, provided in Table 20)
Saudi Arabia	1990-2000 data from 1st National Communication, 2005-2020 data based IEA's growth rate for "Middle East" (where annual growth relates to the 2002-2020 period) (IEA 2004, provided in Table 20)
Slovenia	4th National Communication
South Africa	1990 data from 1st National Communication, data 1995-2020 based on historical trend calculated between 1990-1994
Spain	4th National Communication
Sweden	4th National Communication
Switzerland	4th National Communication
Thailand	Data from 1st National Communication page 53
Turkey	1990-2000 data from IEA 2005a, 2005-2020 data based on growth rate calculated between 2000 and 1990.
Ukraine	1990-2000 data from UNFCCC database, 2005-2020 based on IEA's annual growth for "Other transition economies." (where annual growth relates to the 2002-2020 period) (IEA 2004, provided in Table 20)
United Kingdom	4th National Communication page 43
United States of America	3rd National Communication page 73
Venezuela	1999 data from 1st National Communication, 2000-2020 data based on IEA's annual growth for "Other Latin American countries" (where annual growth relates to the 2002-2020 period) (IEA 2004, provided in Table 20)

Table 20. CO_2 emission growth rates from IEA 2004

IEA, MtCO2 (from energy): 2002-2020			
Country	**2002**	**2020**	**Avg. Annual Growth**
World	23,578	33,225	1.9%
Annex I	14,077	17,166	1.1%
non-Annex I	9,039	15,579	3.1%
United States & Canada	6,123	7,471	1.1%
European Union	3,730	4,400	0.9%
Japan & South Korea	1,649	1,971	1.0%
Australia & N.Zealand	374	454	1.1%
Russia	1,488	1,905	1.4%
Other Transition Economies	956	1,293	1.7%
China	3,309	5,709	3.1%
India	1,015	1,715	3.0%
Indonesia	304	601	3.9%
Other Developing Asia	901	1,832	4.0%
Mexico	359	572	2.6%
Brazil	300	509	3.0%
Other Latin America	553	949	3.0%
Middle East	1,081	1,740	2.7%
Africa	766	1,341	3.2%

Table 21. Detailed assumptions on mitigation costs for CO_2 emissions

Country	Assumptions for CO_2 emissions mitigation costs
UK	UK Energy and CO2 emission projections. Updated projections to 2020. DTI. February 2006 and updated version September 2006.
Greece	4th National Communication
Finland	4th National Communication
Germany	Klimaschutz in Deutschland bis 2030, Endbericht zum Forschungsvorhaben Politikszenarien III, Umweltbundesamt, 2005.
Poland	FCCC/IDR.3/POL Report on the in-depth review of the third national communication of Poland, Nov 2003.
Ukraine	Modelling and analysis of greenhouse gases emissions in Ukraine: Selecting and Adapting the ENPEP Program to Ukrainian Conditions and Test Modeling, Kiev 2001.
Russia	Hot air for sale: a quantitative assessment of Russia's near-term climate policy options, C. Bohringer, U. Moslener, B. Sturm, 2006, Centre for European Economic Research
USA	Energy and Economic impact of H.R.5049, the keep America competitive global warming policy act, 2006, EIA SR/OIAF/2006-03.
Brazil	Greenhouse Gas Mitigation in Brazil: Scenarios and Opportunities through 2025. Center for Integrated Studies on Climate Change and the Environment (Centro Clima) at the Institute for Research and Postgraduate Studies of Engineering at the Federal University of Rio de Janeiro (COPPE/UFRJ), Thelma Krug, Magda Aparecida de Lima, Luiz Gustavo Barioni, Geraldo Martha, Haroldo Machado Filho. Center for Clean Air Policy, November 2006.
China	Greenhouse Gas Mitigation in China: Scenarios and Opportunities through 2030, Tsinghua University of China, Center for Clean Air Policy, November 2006.
South Africa	South African energy policies for sustainable development, Phase 2, Final report. Harald Winkler, Thomas Alfstad, Mark Howells. Energy Research Centre, University of Cape Town, November 2005.
Mexico	Sheinbaum, Claudia and Omar Masera. (2000). Mitigating carbon emissions while advancing national development priorities: The case of Mexico. Climatic Change, 47, 259-282.
All other countries	For all countries except those listed below the reduction potentials were calculated based on emission reduction % from "Baseline scenarios for the revision of the NEC Emission Ceilings Directive, Part 1: Emission projections", Corrected version, September 21, 2006. International Institute for Applied Systems Analysis (IIASA).

APPENDIX B SUMMARY OF DIFFERENT TYPES OF COMMITMENTS

Country	Kyoto Target	Voluntary GHG target		Renewable energy target	
	2012	2010-2020	2021-2050	Current-2020	2021-2050
Argentina		Voluntary reduction target of 2%-10% below projected baseline levels by 2012.			
Australia	8%			Mandatory Renewable Energies Target of 9,500 GWh/y by 2010.	
Austria	-13%			4% electricity to be generated from RES (not hydro) by 2008 78.1% electricity to be generated from RES (inc hydro) by 2010 Renewable Electricity Directive provides a target of 78.1% of electricity consumption from renewable sources by 2011	
Belgium	-8%			Flanders: 25% energy generated from CHP plants by 2010 and 6% from RES. Wallonia: 20% energy generated from CHP plants by 2010 and 8% from RES. Soltherm programme: 200,000 m2 of PV by 2010. Renewable Electricity Directive provides a target of 6% of electricity consumption from renewable sources by 2010	
Brazil					
Bulgaria	-8%			Renewable Electricity Directive provides a target of 11% of electricity consumption from renewable sources by 2010	
China				Target of 20% renewable energy supply in total energy by 2020.	
Cyprus				Renewable Electricity Directive provides a target of 6% of electricity consumption from renewable sources by 2010	
Czech Republic	-8%	Long-term targets of -25% GHG by 2020 from 2000 levels and -30% per capita CO2 from 2000 levels.		State Energy Policy (2004) with renewable electricity target of 8% in 2010 Renewable Electricity Directive provides a target of 8% of electricity consumption from renewable sources by 2010	State Energy Policy (2004) with renewable electricity target of 17% in 2030
Denmark	-21%	Climate Change Strategy 2003 - Aims to meet 50% of Kyoto target through EU ETS by 2012. For the remainder abatement cost threshold of €16/tCO2 set. Below this Denmark will take domestic action, below this will participate in CDM/JI or buy credits		Renewable Electricity Directive provides a target of 29% of electricity consumption from renewable sources by 2010	Proposed target of renewables to provide up to 30% of total energy consumption by 2025
Estonia	-8%			Renewable Electricity Directive provides a target of 5.1% of electricity consumption from renewable sources by 2010	
Finland	0%			Renewable Electricity Directive provides a target of 31.5% of electricity consumption from renewable sources by 2010	
France	0%		Long-term GHG emission reduction target -75% by 2050 (compared to 1990). 3% decrease per year in greenhouse gas emissions.	10% of energy needs produced by renewable sources by 2010 Electricity domestically produced with RE source to represent 21% of domestic electricity consumption by 2010 50% increase in heat production from renewable sources by 2010 (by increasing thermal renewable energy development)	
Germany	-21%	Long-term target of 40% GHG emission reduction by 2020 (compared to 1990) if EU commits to -30%. Aims to reduce industrial GHG emissions by 35% by 2012.		Renewable Electricity Directive provides a target of 12.5% of electricity consumption from renewable sources by 2010	
Greece	25%			Renewable Electricity Directive provides a target of 20.1% of electricity consumption from renewable sources by 2010	
Hungary	-6%			Renewable Electricity Directive provides a target of 3.6% of electricity consumption from renewable sources by 2010	
Iceland	10%		Reduction in GHG emissions by up to 75% by 2050, compared with 1990 levels		
India				Electricity target by 2012: 10% of additional installed capacity until 2012 shall come from renewable energy sources.	
Ireland	13%			Introduce 620 MWh capacity from RES by 2006 Renewable Electricity Directive provides a target of 13.2% of electricity consumption from renewable sources by 2010	
Italy	-6%			Aims to recover energy from 30% of municipal waste by 2010. Renewable Electricity Directive provides a target of 25% of electricity consumption from renewable sources by 2010	

Biofuels target Current-2020	Energy efficiency target Current-2020	Waste target	Energy Intensity	ETS	Additional references
Petrol and diesel must contain 5% bioethanol or biodiesel by 2010					SenterNovem http://gave.novem.nl/novem_2005/index.asp?id=25&detail=1189
Biofuels to contribute at least 350 million litres (ML) to the total fuel supply by 2010					9 February Communique from the Council for the Australian Federation http://www.emissionstrading.net.au/__data/assets/pdf_file/6343/CAF_communique_9feb07.pdf
Biofuels Directive provides indicative target of 5.75% share of biofuels in transport fuel by 2010 for each member state		Landfill Directive requires the reduction of biodegradable municipal waste going to landfill by 75% by 16 July 2006, 50% by 16 July 2009 and 35% by 16 July 2016 (on the basis of total biodegradable municipal waste produced in 1995 or the latest year before 1995 for which standardised Eurostat data is availble; Member States that landfilled more than 80% of their municipal waste in 1995 may postpone each of the targets by a maximum of four years)		Phase II EU ETS NAP cap of 30.7 Mt CO2eq/yr	
Biofuels Directive provides indicative target of 5.75% share of biofuels in transport fuel by 2010 for each member state	Flanders: 25% energy generated from CHP plants by 2010 Wallonia: 20% energy generated from CHP plants by 2010	Landfill Directive (for details see Austria)		Phase II EU ETS NAP cap of 58.5 Mt CO2eq/yr	
23 per cent mix of ethanol to be added to all petroleum supplies in the country (no date available)	Reduction of 130 TWh in electricity consumption by 2015 (PROCEL)				The Independent, 15 March 2007 http://news.independent.co.uk/environment/climate_change/article2328821.ece
5.75% of biofuels in transport fuel by 2008 Biofuels Directive provides indicative target of 5.75% share of biofuels in transport fuel by 2010 for each member state		Landfill Directive (for details see Austria)		proposed Phase II EU ETS cap is 60.4 Mt CO2eq/yr	
			Energy intensity target: -20% primary energy per GDP from 2005 to 2010.		All Energy News 03/03/07, China Daily 28/02/07
Biofuels Directive provides indicative target of 5.75% share of biofuels in transport fuel by 2010 for each member state		Landfill Directive (for details see Austria)			
Biofuels Directive provides indicative target of 5.75% share of biofuels in transport fuel by 2010 for each member state Government has set minimum volumes of biofuel to be delivered 2007-2012.		Landfill Directive (for details see Austria)		Phase II EU ETS NAP cap is 86.8 Mt CO2eq/year	
Biofuels Directive provides indicative target of 5.75% share of biofuels in transport fuel by 2010 for each member state		Landill Directive Target. Aims to reduce waste amounts sent to landfill to 9% in 2008 and increasing recycling to 65% of all waste.			Refocus 18/01/07
Biofuels Directive provides indicative target of 5.75% share of biofuels in transport fuel by 2010 for each member state		Landfill Directive (for details see Austria)			
Biofuels Directive provides indicative target of 5.75% share of biofuels in transport fuel by 2010 for each member state		Landfill Directive (for details see Austria)		Proposed Phase II EU ETS NAP cap is 39.6 Mt	
5.75% of biofuels in transport fuel by 2008 7% of biofuels in transport fuels by 2010. Biofuels Directive provides indicative target of 5.75% share of biofuels in transport fuel by 2010 for each member state 10% of biofuels in transport fuels by 2015		Landfill Directive (for details see Austria)	Reduction of energy final intensity (energy consumption/growth) of 2% per year by 2015, 2.5% per year by 2030	Phase II EU ETS cap is 132.8 Mt CO2eq/yr	
Biofuels Directive provides indicative target of 5.75% share of biofuels in transport fuel by 2010 for each member state		Landfill Directive (for details see Austria)		Phase II EU ETS NAP cap is 453.1 Mt CO2eq/year	
Biofuels to reach 5.75% of total road transport fuels' consumption by 2010. Biofuels Directive provides indicative target of 5.75% of biofuels in transportation fuel by 2010 for each member state		Landill Fill Directive Target. The targets for the reduction of biodegradable wastes landfilled are 75%, 50% and 35% for the years 2010, 2013 and 2020 respectively compared to their production in 1995.		Phase II EU ETS NAP cap is 69.1 Mt CO2eq/year	
From 2005, 0.75% annual increase in share of automotive biofuels to 2010. 5.75% share of automotive biofuels by 2010 Biofuels Directive provides indicative target of 5.75% of biofuels in transport fuel by 2010 for each member state		Landfill Directive (for details see Austria)		Proposed Phase II EU ETS NAP cap is 30.9 Mt CO2eq/year	
					ENDS Europe DAILY 2266, 20/02/07
5.75% of biofuels in transport by 2009 Biofuels Directive provides indicative target of 5.75% share of biofuels in transport fuel by 2010 for each member state 10% of biofuels in transport by 2020		Landfill Directive (for details see Austria)		Phase II EU ETS NAP cap is 21.1 Mt CO2eq/yr	
Biofuels Directive provides indicative target of 5.75% share of biofuels in transport fuel by 2010 for each member state		Landfill Directive (for details see Austria)		Proposed Phase II EU ETS NAP cap is 194 Mt CO2eq/yr	

Country	Kyoto Target 2012	Voluntary GHG target 2010-2020	2021-2050	Renewable energy target Current-2020	2021-2050
Latvia	-8%			Renewable Electricity Directive provides a target of 49.3% of electricity consumption from renewable sources by 2010	
Lithuania	-8%			Renewable Electricity Directive provides a target of 7% of electricity consumption from renewable sources by 2010 12% of TPES to be produced by RES by 2010	
Luxembourg	-28%			Renewable Electricity Directive provides a target of 5.7% of electricity consumption from renewable sources by 2010	
Malta				Renewable Electricity Directive provides a target of 5% of electricity consumption from renewable sources by 2010	
Mexico				At least 8% renewable energy generation in 2012 (under development).	
Netherlands	-6%	30% reduction in greenhouse gas emissions by 2020 compared to 1990		5% of energy from renewable sources by 2010 1500 MW wind onshore by 2010 Renewable Electricity Directive provides a target of 9% of electricity consumption from renewable sources by 2010 10% of energy from renewable sources by 2020 6000MW wind onshore by 2020	
New Zealand	0%			Increasing New Zealand's renewable energy supply to provide a further 30 petajoules of consumer energy by 2012.	
Norway	1%		Long term reductions of up to -80% from 1990 levels by 2050.	Objective to achieve 12 TWh per year in new renewable energy production and energy savings by 2010.	
Philippines					
Poland	-6%			Renewable Electricity Directive provides a target of 7.5% of electricity consumption from renewable sources by 2010 Increase share of RE in primary energy production by 14% by 2020 and increase to 1% energy recovered from waste by 2020	
Portugal	27%			Renewable Electricity Directive provides a target of 39% of electricity consumption from renewable sources by 2010 Target of 100,000 m2/y solar panels during 2007-2020.	
Romania	-8%			Renewable Electricity Directive provides a target of 33% of electricity consumption from renewable sources by 2010. In 2004, the Romanian government introduced a quota system with tradable green certificates (TGC) to support renewable electricity. The mandatory quota for electricity suppliers was 0.7% in 2005, increasing to 4.3% in 2010. TGCs are issued for electricity production from wind, solar, biomass or hydropower generated in plants with capacity smaller than 10 MW.	
Slovakia	-8%			Renewable Electricity Directive provides a target of 31% of electricity consumption from renewable sources by 2010	
Slovenia	-8%			Renewable Electricity Directive provides a target of 33.6% of electricity consumption from renewable sources by 2010	
South Africa				Renewable electricity target of additional 10000 GWh by 2013.	
Spain	15%			12% of energy production from renewables by 2010. Renewable Electricity Directive provides a target of 29.4% of electricity consumption from renewable sources by 2010	
Sweden	4%	CO2 emissions from transport to be stabilised at 1990 levels by 2010.	Global Long-term GHG emissions target of less than 550 ppm CO2eq by 2050.	Renewable Electricity Directive provides a target of 60% of electricity consumption from renewable sources by 2010 Aims to be independent from oil by 2020	
Switzerland	-8%	Transport fuels' emissions to be reduced by 8% by 2010. Emissions from heating/process fuels are to be lowered by 15% by 2010.			
Thailand				Set minimum share of solar in electricity production.	
United Kingdom	-13%	Medium term target of 20% CO2 reduction (compared to 1990) by 2010.	60% CO2 reduction by 2050 (voluntary target, but legislation is pending to make this a binding target)	Obligation on electricity suppliers to supply target percentage of elec from renewable sources each year. The target for 2006/07 is 6.7%. Renewable Electricity Directive provides a target of 10% of electricity consumption from renewable sources by 2010 The Renewables Obligation target rises to 15.4% by 2015/16	
United States of America	-7%	National target of improving emissions per GDP by 18% from 2002 to 2012 which results in roughly 20% increase of absolute emissions above 1990 levels. 28 states developed voluntary targets. California's reduction target is -11% by 2010 from 2000 levels, and -80% by 2050 from 1990 levels.		Renewable Portfolio Standards - minimum targets for renewable electricity - in many states.	

Biofuels target Current-2020	Energy efficiency target Current-2020	Waste target	Energy Intensity	ETS	Additional references
Biofuels Directive provides indicative target of 5.75% share of biofuels in transport fuel by 2010 for each member state		Landfill Directive requires the reduction of biodegradable municipal waste going to landfill by 75% by 16 July 2006, 50% by 16 July 2009 and 35% by 16 July 2016 (on the basis of total biodegradable municipal waste produced in 1995 or the latest year before 1995 for which standardised Eurostat data is availble; Member States that landfilled more than 80% of their municipal waste in 1995 may postpone each of the targets by a maximum of four years)		Phase II EU ETS NAP cap is 3.3 Mt CO2eq/year	
Biofuels Directive provides indicative target of 5.75% share of biofuels in transport fuel by 2010 for each member state 15 % biofuels in road fuels by 2020	35% of electricity to be generated by CHP by 2020	Landfill Directive (for details see Latvia)		Phase II EU ETS NAP cap is 8.8 Mt CO2eq/year	
Biofuels Directive provides indicative target of 5.75% share of biofuels in transport fuel by 2010 for each member state		Landfill Directive (for details see Latvia)		Phase II EU ETS NAP cap is 2.7 Mt CO2eq/year	
Biofuels Directive provides indicative target of 5.75% share of biofuels in transport fuel by 2010 for each member state		Landfill Directive (for details see Latvia)		Phase II EU ETS NAP cap is 2.1 Mt CO2eq/year	
Biofuels Directive provides indicative target of 5.75% share of biofuels in transport fuel by 2010 for each member state		Landfill Directive (for details see Latvia)		Phase II EU ETS NAP cap is 85.8 MtCO2eq/yr	
	20% improvement in energy efficiency by 2012 (equivalent of a continual improvement rate of 2 percent p.a. to 2012)				NZ National Energy Efficiency and Conservation Strategy 2001 http://www.eeca.govt.nz/eeca-library/eeca-reports/neecs/report/national-energy-efficiency-and-conservation-strategy-01.pdf
A new law was recently signed by the PM requiring that all diesel must contain 1% biodiesel. After two years (presumably in 2009) this percentage increases to 2%, and petrol must contain 5% bioethanol. The percentage of bioethanol must then increase gradually, reaching 10% after four years (presumably by the end of 2011)					GAVe 23/01/07
Biofuels Directive provides indicative target of 5.75% share of biofuels in transport fuel by 2010 for each member state		Landfill Directive (for details see Latvia) 2%/y of waste to be converted into compost.		Phase II EU ETS NAP cap is 208.5 Mt CO2eq/year	
Biofuels to reach 10% of transport fuels by 2010.	Reduction in energy distribution losses by 8,6% by 2010. Cogeneration to increase to 18% of gross electricity consumption by 2010. Increase energy efficiency in buildings by ca 40%.	Landfill Directive (for details see Latvia)		Proposed Phase II EU ETS NAP cap is 33.9 Mt CO2eq/year	ENDS *Europe* DAILY 2248, 25/01/07
Biofuels Directive provides indicative target of 5.75% share of biofuels in transport fuel by 2010 for each member state		Landfill Directive (for details see Latvia)		Proposed Phase II EU ETS NAP cap is 91.5 Mt CO2eq/year	GreenPrices 24/01/07
Biofuels Directive provides indicative target of 5.75% share of biofuels in transport fuel by 2010 for each member state		Landfill Directive (for details see Latvia)		Phase II EU ETS NAP cap is 30.9 Mt CO2eq/year	
Biofuels Directive provides indicative target of 5.75% share of biofuels in transport fuel by 2010 for each member state	Doubling cogeneration electricity by 2010 from 2000 levels.	Landfill Directive (for details see Latvia)		Proposed Phase II EU ETS NAP cap is 8.3Mt CO2eq/year	
	Reduction of 12% of final energy in 2015 compared to the base case.				
Biofuels Directive provides indicative target of 5.75% share of biofuels in transport fuel by 2010 for each member state		Landfill Directive (for details see Latvia)		Phase II EU ETS NAP cap is 152.3 Mt CO2eq/year	
Biofuels Directive provides indicative target of 5.75% share of biofuels in transport fuel by 2010 for each member state		Landfill Directive (for details see Latvia)		Phase II EU ETS NAP cap is 22.8 Mt CO2eq/year	
	target of 40% energy from waste plants re-used in district heating and elecricity generation.reduce consumption of fossil fuels by 10% by 2010.				
5% of road fuels to come from renewable sources by 2010 (Road Transport Fuel Obligation). Biofuels Directive provides indicative target of 5.75% share of biofuels in transport fuel by 2010 for each member state	Indicative target of 10GW of installed CHP capacity by 2010	Landfill Directive (for details see Latvia)		Phase II EU ETS NAP cap is 246.2 Mt CO2eq/year	
Under the Mandatory Renewable Fuel Standard, fuel blenders must use 7.5 billion gallons of renewable fuels in 2012 Proposed mandatory RFS target for 2017 is 35 billion gallons of renewable and alternative fuels.	proposed target of reducing gasoline usage by 20% by 2017				President Bush's State of the Union Address 2007 http://www.whitehouse.gov/news/releases/2007/01/20070123-2.html

APPENDIX C DESCRIPTION OF THE EVOC TOOL

This section describes the Evolution of Commitments tool (EVOC) version 7, developed at Ecofys, that is used to quantify emission allowances under the various approaches in this report. It includes emissions of CO_2, CH_4, N_2O, hydroflourocarbons (HFCs), perflourocarbons (PFCs) and sulphur hexafluoride (SF_6) for 192 individual countries. Historical emissions are based on national emission inventories submitted to the UNFCCC and, where not available, other sources such as the International Energy Agency. Future emissions are based on the IPCC Special Report on Emissions Scenarios (Nakicenovic et al. 2000). The greenhouse gas emission data for 1990 to 2003 is derived by an algorithm that combines emission estimates from various sources.

We first collected historical emission estimates by country, by gas and by sector from the following sources and ordered them in the following hierarchy:

1. National submissions to the UNFCCC as collected by the UNFCCC secretariat and published in the GHG emission database available at their web site. For Annex I countries, the latest available year is usually 2004. Most non-Annex I countries report only or until 1994 (UNFCCC 2005).
2. CO_2 emissions from fuel combustion as published by the International Energy Agency. The latest available year is 2003 (IEA 2005a).
3. Emissions from land-use change as published by Houghton in the WRI climate indicator analysis tool (Houghton 2003).
4. Emissions from CH_4 and N_2O as estimated by the US Environmental Protection Agency. Latest available year is 2005 (USEPA 2006a)
5. CO_2, CH_4, N_2O, HFC, PFC and SF_6 emissions from the EDGAR database version 3.2 available for 1990 and 1995 (Olivier and Berdowski 2001).[11]

Future emissions are derived from the MNP/RIVM IMAGE implementation of the SRES scenarios (IMAGE team 2001).

The datasets vary in their completeness and sectoral split. We first defined which of the sectors provided in the datasets correspond to 7 sectors. This definition is provided in Table 22. Note that CO_2 emissions from the IEA do not include process emissions from cement production. Hence, if IEA data is chosen, process emissions from cement production are not included.

For each country, gas and sector, the algorithm completes the following steps:

1. For all data sets, missing years in-between available years within a data set are linearly interpolated and the growth rate is calculated for each year step.
2. The data source is selected, which is highest in hierarchy and for which emission data are available. All available data points are chosen as the basis for absolute emissions.
3. Still missing years are filled by applying the growth rates from the highest data set in the hierarchy for which a growth rate is available.

As future emissions are only available on a regional basis and not country-by-country, the resulting set of emissions is then extended into the future by applying the growth rates of the respective sectors and gas of the region to which the country belongs.

[11] For CH_4 and N_2O, the values of EPA are largely based on the EDGAR database (1990 and 1995), but extended to the year 2000.

Table 22. Data sources and definition of sectors

	UNFCCC		**Edgar 3.2 database**		**USEPA**		**LUCF Houghton**		**IEA**		**IMAGE CD**	
	Regional:	country by country	**Regional:**	country by country	**Regional:**	country-by country	**Regional:**	country-by country	**Regional:**	country by country	**Regional:**	17 regions
	Temporal:	1990 to 2002 (various)	**Temporal:**	1990 and 1995	**Temporal:**	1990-2020	**Temporal:**	1950-2000	**Temporal:**	1970-2000	**Temporal:**	1970 to 2100
	Gas:	CO2, CH4, N2O, HFCs, PFCs, SF6	**Gas:**	CO2, CH4, N2O; HFCs, PFCS, SF6	**Gas:**	CH4, N2O	**Gas:**	CO2	**Gas:**	CO2	**Gas:**	CO2, CH4, N2O, HFCs, PFCs, SF6
Industry												
	1A2	Manufacturing Industries and Construction	**F10**	Industry					3T Other Energy Industries		ENERGY 01 Industry	
	2A0	Mineral Products	**F30**	Other transformation sectors					401 Iron and Steel		ENERGY 07 Other energy transformation	
	2B0	Chemical Industry	**B10CH4N2O**	Biofuel industry CH4 N2O					402 Chemical and Petrochemical		INDUS 01 Feedstocks	
	2C0	Metal Production	**B30CH4N2O**	Biofuel charcoal production CH4 N2O					403 Non-Ferrous Metals		INDUS 02 Industrial activities	
	2D0	Other Production	**I10**	Iron and steel					404 Non-Metallic Minerals			
	2G0	Other (Industrial Processes)	**I20**	Non-ferrous metals					409 Paper, Pulp and Printing			
			I30	Chemicals					405 Transport Equipment			
			I40	Building materials					406 Machinery			
			I50	Pulp and paper					407 Mining and Quarrying			
			I60	Food					408 Food and Tobacco			
			I70	Solvent use/Miscellaneous					410Wood and Wood Products			
			I80	Transport evaporation					411 Construction			
			I90	Miscellanecus industry					412 Textile and Leather			
			F60	non-energy use and feedstocks					413 Non-specified Industry			
									414 Non-Energy Use Ind/Transf/Energy			
									If the IEA data set is chosen, process emissions from industry (e.g. from cement) are not covered			
Electricity												
	1A1	Energy Industries	**F20**	Power generation					11 Public Electricity Plants		ENERGY 06 Electric power generation	
			B20CH4N2O	Biofuel power generation CH4 N2O					12 Public CHP Plants			
									13 Public Heat Plants			
									14 Own Use in Electricity, CHP and heat plants			
									21 Autoproducer Electricity Plants			
									22 Autoproducer CHP Plants			
									23 Autoproducer Heat Plants			
Domestic												
	1A3	Transport	**F40**	Residential, commercial and other sectors					5T Transport		ENERGY 02 Transport	
	1A4	Other Sectors (Fuel Combustion)	**F51**	Transport road					6T Other Sectors		ENERGY 03 Residential (households)	
	1A5	Other (Fuel Combustion)	**F54**	Transport land non-road					*MB Memo: International Marine Bunkers*		ENERGY 04 Services (commercial and public)	
	2E0	Production of Halocarbons and Sulphur Hexafluoride	**F57**	Transport air (international and domestic)					*AB Memo: International Aviation Bunkers*		ENERGY 05 Agriculture and other enduse	
	2F0	Consumption of Halocarbons and Sulphur Hexafluoride	***F58***	*Transport international shipping*							*ENERGY 09 Marine bunkers*	
	3TT	TOTAL Solvent and Other Product Use	**B40CH4N2O**	Biofuel residential CH4 N2O							FGAS	
	977	*TOTAL International Bunkers*	**B51CH4N2O**	Biofuel transport road CH4 N2O								
			C10	HFC-byproc.								
			C20	HFC use								
			C30	PFC-byproc.								
			C40	PFC use								
			C50	SF6 use								
	Secotors in italics are excluded when the user chooses to exclude international transport											
Fossil fuel production												
	1BT	TOTAL Fugitive Emissions from Fuels	**F70**	Coal production	02 Coal production				7T Differences due to Losses and/or Transformation		ENERGY 08 Fossil fuel production	
			F80	Oil production, transmission and handling	03 Natural gas production							
			F90	Gas production and transmission	04 Oil production							
			F95	Fossil fuel fires								
Agriculture												
	4TT	TOTAL Agriculture	**L10**	Fertiliser use	06 Manure management						LAND 10 wetland rice	
			L15	Rice cultivation	07 Enteric fermentation						LAND 11 animals	
			L20	Enteric fermentation	08 Rice production						LAND 12 animal waste	
			L30	Animal waste management (confined N2O, all CH4)	09 Agricultural soils						LAND 14 fertilizer	
			L50	Crop production							LAND 15 indirect fertilizer	
			L60	Animal waste management (deposited on soil- N2O)							LAND 16 indirect animal waste	
			L71	Atmospheric deposition							LAND 17 crop residues	
			L75	Leaching and run-off							LAND 18 biological N-fixation	
LUCF												
	5TT	TOTAL Land-Use Change & Forestry	**L41**	BB-Deforestation	10 Biomass combustion		Land-use				LAND 01 biomass burning	
			L42	BB-Savanna burning							LAND 02 burning of traditional biomass / fuelwood burning	
			L43	BB-Agricultural waste burning							LAND 03 timber pool (short lifetime)	
			L44	BB-Vegetation fires							LAND 04 timber pool (long lifetime)	
			L45	BB-deforestation post burn effects							LAND 05 carbon release by regrowing vegetation (-NEP)	
											LAND 06 agricultural waste burning	
											LAND 07 savanna burning	
											LAND 13 land clearing	
Waste												
	6TT	TOTAL Waste	**W10**	Landfills	11 Landfills						LAND 08 landfills	
			W15	Humans/pets	12 Wastewater						LAND 09 (domestic) sewage	
			W20	Waste water treatment								
			W30	Human waste disposal								
			W40	Waste incineration								
			W50	Miscelaneous waste handling (hazardous waste)								
	CO2 emissions from Biomass buring (UNFCCC sector 1A8 and EGRAR sectors B10 to B51) are not included as they are not to be included in the national totals according to teh IPCC guidelines and the UNFCCC repsoting guidelines)											

The user can specify the following:

- Whether the emissions are determined on the basis of the hierarchy or are based exclusively on the EDGAR database
- Whether to consider only CO_2, the group of CH_4 and N_2O or the group of CO_2, CH_4, N_2O, HFC, PFCs and SF_6
- Whether the analysis should
    - exclude emissions from land use change and forestry
    - include emissions from land use change and forestry from the hierarchy
    - include emissions from land use change and forestry from Houghton
    - include emissions from land use change and forestry from EDGAR
- Whether international aviation and marine transport is included or excluded

For population, GDP in purchase power parities and electricity demand, the country base year data was taken from UN (2002) and IEA (2002a) and extended into the future applying the growth rates from the IMAGE model for the region to which the country belongs.

Emissions until 2010 are estimated as follows: It is assumed that Annex I countries implement their Kyoto targets by 2010. It is assumed that the reductions necessary to meet the Kyoto target are achieved in all sectors equally. In 2010, the level of the domestic sector is taken from the relevant reference scenario. The level of the other sectors are taken from the reference scenario and reduced, so that the Kyoto target is met. The years from the last available year to 2010 are linearly interpolated. All non-Annex I countries follow their reference scenario until 2010.

Additionally, the user can select the following:

- Whether the USA reaches in 2010
    - Its Kyoto target
    - Its national target, which we interpreted as a 23% increase of total emissions from 1990 to 2010 (default setting for this report)
    - Its reference emissions
- Whether all other Annex I countries reach in 2010
    - Their Kyoto targets
    - The lower of their Kyoto target and their reference scenario (default setting for this report)
    - Their reference emissions

As a default setting, all Annex I countries are assumed to reach the lower of their Kyoto target and their reference scenarios in 2010. Only the USA is assumed to reach only its national target which we interpreted as a 23% increase of total emission from 1990 to 2010. All non-Annex I countries follow their reference scenario until 2010. After 2010, the emissions are calculated according to the approaches.

A limitation of the tool is the unknown future development of emissions of individual countries. Here, we have used the standard set of future emissions scenarios, the IPCC SRES scenarios, as a basis. They provide a broad range of storylines and therefore a wide range of possible future emissions. We cover this full range of possible future emissions, economic and population development in a consistent manner. But the SRES scenarios are only available at the level of up to 17 regions (as in the IMAGE implementation) and scaling them down to individual countries introduces an additional element of uncertainty. We applied the growth rates provided for 17 world regions on the latest available data points of the individual countries within the respective regions. So on the level of regions, we cover the full-range uncertainty about future emissions. When again aggregating the regions, the effect of downscaling cancels out. But the full level of uncertainty is not covered on the national level as substantial differences may exist for expected growth for countries within one of the 17 regions.

The future reference development of emissions, economic and population is affected by the starting values (which is data available from the countries or other international sources and which can be substantially different for countries in one region) and the assumed growth rates (which are derived from the 17 regions).

The assumed growth rates may affect the results of countries to a different extent. Some countries are less affected as they dominate their regional group, such as Brazil, Mexico, Egypt, South Africa, Nigeria, Saudi Arabia, China and India. It is for second or third largest countries in a region or for members of an inhomogeneous group, for which this method may lead to an over or underestimation of the future development.

Second or third largest countries in a region are e.g. Argentina, Venezuela, United Arab Emirates and South Korea. In the Contraction and Convergence approach, the error would be small as countries follow their reference scenario only until 2010 and converge afterwards. For Common but Differentiated Convergence and Multistage, the downscaling method may influence the time of participation. But the countries listed above would all participate at the earliest possible moment, based on their already today high per capita emissions. In the Triptych approach, growth in industrial and electricity production and a reduction below reference for agriculture is used, which may be affected by the downscaling method.

Members of an inhomogeneous group would be those of South East Asia, which includes Indonesia and the Philippines as lower-income countries and Malaysia, Singapore and Thailand as higher-income countries. Here the growth is averaged over the region, probably underestimated for Indonesia and the Philippines and overestimated for Singapore. The dominant element here is the starting point. The low per capita emissions of the Philippines and Indonesia lead to their late participation, while the high per capita emissions in Malaysia, Singapore and Thailand lead to their immediate participation. In the Triptych approach, growth in industrial and electricity production and a reduction below reference for agriculture is used, which may be affected by the downscaling method.

For Annex I countries, the future reference development is not as relevant since they always participate in the regime on the highest stage and have to reduce emissions independent of the reference development. Future values are only relevant for intensity targets (GDP) or for the Triptych approach (industrial and electricity production).

A different uncertainty is introduced since our future emissions are static, meaning that emissions in non-participating developing countries do not change as a result of ambitious or relaxed emission reductions in developed countries. Stringent reductions could affect emissions of non-participating countries in two ways. There could be increased emissions through migration of energy-intensive industries or decreased emissions due to technology spill-over. Overall, we assume that this effect is small and not significantly influencing the results of this analysis.

For the calculations in section 3.2 the groups of Annex I and non-Annex I are considered as they were until 2006. Afterwards Kazakhstan moved to Annex I and Belarus, being Annex I country already, adopted a Kyoto target. These developments are only included in section 3.3 where each Annex I country is considered separately.

Explanation of the regions

EVOC 01 USA: United States of America

EVOC 02 EU15, Old EU Member states: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom

EVOC 03 EU+10, New EU Member states: Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, Slovenia

EVOC 04 RWEU, Rest of Western Europe: Iceland, Liechtenstein, Monaco, Norway, San Marino, Switzerland

EVOC 05 RUS: Russian Federation

EVOC 06 REEU in Annex I, Rest of Eastern Europe in Annex I: Bulgaria, Croatia, Romania, Ukraine

EVOC 07 JPN: Japan

EVOC 08 RAI, Rest of Annex I: Australia, Canada, New Zealand

EVOC 09 TUR: Turkey

EVOC 10 REEU, Rest of former soviet states: Albania, Armenia, Azerbaijan, Belarus, Bosnia & Herzegovina, Georgia, Kazakhstan, Kyrgyzstan, FYR Macedonia, Moldova, Serbia & Montenegro, Tajikistan, Turkmenistan, Uzbekistan

EVOC 11 ARG: Argentina

EVOC 12 BRZ: Brazil

EVOC 13 MEX: Mexico

EVOC 14 VEN: Venezuela

EVOC 15 RLA: Rest of Latin America: Bahamas, Barbados, Belize, Bolivia, Chile, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Nicaragua, Panama, Paraguay, Peru, Saint Kitts & Nevis, Saint Lucia, Saint Vincent & Grenadines, Suriname, Trinidad & Tobago, Uruguay

EVOC 16 EGY: Egypt

EVOC 17 ZAF: South Africa

EVOC 18 NGA: Nigeria

EVOC 19 RNA, Rest of North Africa: Algeria, Libya, Morocco, Tunisia

EVOC 20 RAF, Rest of Africa: Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo, Dem. Republic Congo, Côte d'Ivoire, Djibouti, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Rwanda, Sao Tome & Principe, Senegal, Seychelles, Sierra Leone, Sudan, Swaziland, Tanzania, Togo, Uganda, Zambia, Zimbabwe

EVOC 21 SAU: Saudi Arabia

EVOC 22 ARE: United Arab Emirates

EVOC 23 RME, Rest of Middle East: Bahrain, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Oman, Qatar, Syria, Yemen

EVOC 24 CHN: China

EVOC 25 IND: India

EVOC 26 IDN: Indonesia

EVOC 27 KOR: Korea (South)

EVOC 28 MYS: Malaysia

EVOC 29 PHL: Philippines

EVOC 30 SGP: Singapore

EVOC 31 THA: Thailand

EVOC 32 RAA, Rest of Asia: Afghanistan, Bangladesh, Bhutan, Brunei, Cambodia, Cook Islands, Fiji, Kiribati, Korea (North), Laos, Maldives, Marshall Islands, Federated States of Micronesia, Mongolia, Myanmar, Nauru, Nepal, Niue, Pakistan, Palau, Papua New Guinea, Samoa, Solomon Islands, Sri Lanka, Taiwan, Timor-Leste (East Timor), Tonga, Tuvalu, Vanuatu, Vietnam

Figure 01 USA: United States of America

Figure 02 EU25: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, United Kingdom

Figure 03 FRA: France

Figure 04 GER: Germany

Figure 05 UK: United Kingdom

Figure 06 R+EEU: Belarus, Bulgaria, Croatia, Romania, Russian Federation, Ukraine

Figure 07 JPN: Japan

Figure 08 RAI, Rest of Annex I: Australia, Canada, Iceland, Liechtenstein, Monaco, New Zealand, Norway, San Marino, Switzerland

Figure 09 REEU, Rest of former soviet states: Albania, Armenia, Azerbaijan, Belarus, Bosnia & Herzegovina, Georgia, Kazakhstan, Kyrgyzstan, FYR Macedonia, Moldova, Serbia & Montenegro, Tajikistan, Turkey, Turkmenistan, Uzbekistan

Figure 10 LAM, Latin America: Argentina, Bahamas, Barbados, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Saint Kitts & Nevis, Saint Lucia, Saint Vincent & Grenadines, Suriname, Trinidad & Tobago, Uruguay, Venezuela

Figure 11 AFR, Africa: Algeria, Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo, Dem. Republic Congo, Côte d'Ivoire, Djibouti, Egypt, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Libya, Madagascar, Malawi, Mali, Mauritania, Mauritius, Morocco, Mozambique, Namibia, Niger, Nigeria, Rwanda, Sao Tome & Principe, Senegal, Seychelles, Sierra Leone, South Africa, Sudan, Swaziland, Tanzania, Togo, Tunisia, Uganda, Zambia, Zimbabwe

Figure 12 ME, Middle East: Saudi Arabia, United Arab Emirates, Bahrain, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Oman, Qatar, Syria, Yemen

Figure 13 SAsia, South Asia: India, Pakistan, Afghanistan, Bangladesh, Bhutan, Sri Lanka, Maldives, Nepal

Figure 14 CPAsia, Centrally Planned Asia: China, Korea (North), Mongolia

Figure 15 EAsia, East Asia: Brunei, Cambodia, Cook Islands, Fiji, Indonesia, Kiribati, Korea (South), Laos, Malaysia, Marshall Islands, Federated States of Micronesia, Myanmar, Nauru, Niue, Palau, Papua New Guinea, Philippines, Samoa, Singapore, Solomon Islands, Taiwan, Thailand, Timor-Leste (East Timor), Tonga, Tuvalu, Vanuatu, Vietnam

APPENDIX D RESULTS IN TABLES

This section includes the detailed figures (median, minimum and maximum) of the calculations from Section 3. All calculations should meet the global CO_2 emission reference points for each emission stabilisation level described in Section 3.1, Figure 4. The median of each calculation meets these reference points with a maximum deviation of ± 1.5 percentage points. This is caused by the parameter choice: We tried to choose the values of the variables to be divisible by 5 where possible. If a higher level of detail was needed to reach the target level the figures should have as few decimal places as possible. This shall avoid implying a level of detail that cannot be assumed for scenarios until 2050. The deviations from the global reference points do not carry weight.

Table 23. Results for the calculations on 450 ppmv CO_2eq. in 2020 from Section 3.2, (Figure 8 and Figure 9)

450 ppmv CO_2eq.	Emissions in Mt CO_2eq.		C&C 2050 Values as % of 1990 2020			CDC Values as % of 1990 2020			Multistage Values as % of 1990 2020			Triptych Values as % of 1990 2020			Sectoral Values as % of 1990 2020			Intensity Values as % of 1990 2020			Reference Values as % of 1990 2020		
Year	1990	2010																					
Country group			Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max
EVOC 01 USA	6308	7706	-19.67%	-18.37%	-15.66%	-9.89%	-9.67%	-8.74%	-38.29%	-38.03%	-37.72%	-9.91%	-8.35%	-8.13%				-17.89%	-13.33%	-12.31%	13.93%	23.76%	29.15%
EVOC 02 EU15	4457	4848	-34.36%	-33.52%	-31.36%	-35.23%	-34.10%	-33.74%	-35.64%	-35.31%	-35.10%	-31.96%	-30.81%	-30.35%				-40.32%	-35.06%	-34.58%	2.95%	15.95%	20.81%
EVOC 03 EU+10	991	879	-40.93%	-38.27%	-37.60%	-43.17%	-39.84%	-38.19%	-43.76%	-41.35%	-39.76%	-37.81%	-32.57%	-28.24%				-42.80%	-29.44%	-23.55%	-6.04%	10.37%	26.02%
EVOC 04 RWEU	117	130	-29.33%	-28.48%	-26.16%	-31.32%	-30.10%	-29.70%	-30.30%	-29.96%	-29.74%	-12.56%	-6.58%	-2.93%				-36.90%	-31.37%	-30.84%	5.24%	17.68%	22.79%
EVOC 05 RUS	2839	2082	-50.78%	-48.50%	-47.69%	-51.46%	-47.67%	-46.08%	-54.62%	-52.67%	-51.32%	-49.41%	-45.03%	-41.23%				-48.27%	-37.23%	-31.14%	-27.95%	-13.27%	-3.51%
EVOC 06 REEU in Annex I	1445	824	-58.96%	-57.31%	-56.63%	-61.57%	-59.05%	-57.72%	-59.54%	-57.56%	-55.74%	-57.89%	-53.39%	-48.83%				-60.93%	-52.09%	-47.54%	-42.09%	-30.85%	-22.93%
EVOC 07 JPN	1313	1501	-31.82%	-31.03%	-28.75%	-34.34%	-33.01%	-32.99%	-31.73%	-31.26%	-31.06%	-30.89%	-29.73%	-29.04%				-42.61%	-39.31%	-38.53%	-2.81%	13.49%	17.53%
EVOC 08 RAI	1119	1499	-33.54%	-32.51%	-30.28%	-28.04%	-27.52%	-26.64%	-43.90%	-43.61%	-43.40%	-26.40%	-25.27%	-25.05%				-35.48%	-30.94%	-30.35%	23.26%	38.37%	43.57%
EVOC 10 REEU	993	871	-36.13%	-33.01%	-31.74%	-39.77%	-35.00%	-32.53%	-46.94%	-36.51%	-29.53%	-35.46%	-28.14%	-21.20%				-38.97%	-25.28%	-17.79%	-12.29%	5.36%	17.50%
EVOC 11 ARG	237	412	24.55%	27.97%	33.28%	29.33%	35.83%	42.91%	18.54%	36.86%	41.48%	33.39%	42.99%	46.37%	102.04%	133.99%	142.20%	28.23%	45.38%	49.87%	114.61%	146.21%	154.23%
EVOC 12 BRZ	664	1205	42.46%	46.37%	52.99%	38.19%	45.33%	53.94%	35.84%	55.36%	59.52%	51.51%	62.98%	70.02%	94.16%	123.93%	147.24%	33.02%	51.68%	55.77%	112.77%	141.41%	147.24%
EVOC 13 MEX	377	687	43.40%	48.51%	53.33%	38.65%	46.96%	53.67%	34.67%	63.48%	76.41%	35.49%	45.75%	48.47%	43.18%	87.02%	105.78%	35.92%	56.80%	61.98%	113.37%	154.30%	170.67%
EVOC 14 VEN	181	346	33.03%	35.06%	42.07%	40.70%	47.36%	56.70%	41.19%	63.98%	72.39%	51.25%	61.85%	63.44%				42.86%	59.01%	64.64%	158.14%	198.47%	213.84%
EVOC 15 RLA	693	1434	57.63%	63.70%	69.31%	57.96%	67.53%	74.90%	54.68%	65.84%	78.88%	67.14%	83.60%	86.37%				52.61%	75.94%	81.87%	140.72%	179.34%	187.13%
EVOC 16 EGY	115	254	125.92%	132.77%	135.13%	95.56%	107.13%	111.40%	189.55%	236.67%	257.19%	86.87%	102.66%	108.13%				82.33%	111.84%	117.53%	189.55%	236.67%	257.19%
EVOC 17 ZAF	335	484	10.45%	10.80%	15.38%	25.91%	26.25%	26.53%	9.37%	17.17%	31.85%	20.38%	27.62%	29.66%	-34.46%	1.25%	17.27%	17.56%	37.94%	38.47%	69.88%	96.15%	106.02%
EVOC 18 NGA	188	461	150.37%	155.98%	164.25%	126.72%	134.31%	139.83%	197.32%	287.64%	313.58%	133.88%	153.69%	163.12%				100.67%	148.59%	155.52%	197.32%	287.64%	313.58%
EVOC 19 RNA	196	426	89.32%	97.31%	98.46%	91.05%	103.22%	106.27%	91.18%	128.22%	145.76%	74.27%	90.98%	96.78%				77.09%	108.70%	115.02%	168.86%	217.93%	240.51%
EVOC 20 RAF	560	1089	168.26%	171.63%	177.41%	139.08%	164.15%	173.31%	163.37%	203.16%	216.63%	104.65%	122.00%	127.17%				64.71%	97.31%	99.68%	174.46%	226.92%	241.24%
EVOC 21 SAU	211	468	46.84%	52.68%	55.14%	70.40%	84.89%	88.14%	47.82%	69.01%	76.83%	71.19%	88.75%	95.51%	36.05%	77.24%	95.55%	72.54%	101.49%	108.39%	173.26%	209.24%	222.60%
EVOC 22 ARE	94	215	40.44%	45.93%	48.36%	72.63%	87.48%	90.54%	32.51%	51.27%	59.58%	72.17%	88.22%	95.11%				78.27%	107.57%	115.29%	184.30%	222.78%	241.69%
EVOC 23 RME	596	1311	69.80%	76.82%	79.48%	77.71%	93.11%	96.64%	74.12%	97.91%	106.16%	72.74%	87.68%	94.12%				71.33%	100.06%	106.89%	169.06%	204.92%	218.61%
EVOC 24 CHN	3504	6820	56.25%	62.85%	66.33%	35.32%	48.93%	52.02%	29.58%	62.50%	76.68%	41.19%	65.57%	70.33%	8.09%	69.95%	98.42%	30.56%	75.21%	81.95%	103.57%	151.33%	172.13%
EVOC 25 IND	1079	2318	153.26%	168.45%	169.33%	158.64%	180.91%	192.63%	158.64%	235.28%	262.27%	67.24%	103.71%	112.21%	48.98%	137.42%	178.66%	47.96%	116.46%	129.05%	158.64%	235.28%	262.27%
EVOC 26 IDN	279	694	144.38%	153.14%	157.97%	92.90%	112.44%	113.84%	170.09%	239.00%	254.16%	89.02%	121.60%	126.96%	170.09%	163.95%	187.63%	67.10%	121.93%	127.73%	170.09%	239.00%	254.16%
EVOC 27 KOR	300	729	56.78%	67.74%	70.99%	55.34%	75.22%	79.04%	41.76%	80.55%	100.22%	69.22%	110.27%	117.35%	73.35%	147.93%	188.85%	59.69%	119.01%	127.64%	159.34%	228.63%	262.93%
EVOC 28 MYS	65	155	83.88%	91.67%	98.63%	70.96%	88.02%	92.33%	63.88%	107.31%	112.96%	71.26%	95.86%	98.85%				62.82%	115.55%	119.26%	158.69%	223.24%	230.53%
EVOC 29 PHL	80	160	143.13%	149.64%	153.12%	121.66%	174.70%	186.91%	121.66%	174.70%	186.91%	68.14%	95.51%	100.21%				35.57%	79.24%	83.79%	121.66%	174.70%	186.91%
EVOC 30 SGP	30	73	54.25%	66.19%	72.72%	60.79%	82.75%	86.35%	48.64%	95.26%	107.88%	74.05%	118.86%	125.44%				61.75%	118.86%	123.90%	172.24%	257.62%	276.74%
EVOC 31 THA	170	405	86.42%	94.96%	99.11%	72.12%	88.68%	89.79%	68.26%	111.22%	122.77%	85.97%	123.63%	130.37%	51.40%	138.42%	163.63%	61.39%	113.03%	118.78%	163.81%	227.26%	242.36%
EVOC 32 RAA	757	1437	110.59%	117.31%	118.83%	81.02%	102.17%	110.19%	78.33%	113.75%	126.83%	50.40%	73.56%	78.64%				40.21%	85.43%	93.25%	112.30%	155.29%	171.79%
Figure 01 USA	6308	7706	-19.67%	-18.37%	-15.66%	-9.89%	-9.67%	-8.74%	-38.29%	-38.03%	-37.72%	-9.91%	-8.35%	-8.13%				-17.89%	-13.33%	-12.31%	13.93%	23.76%	29.15%
Figure 02 EU25	5448	5727	-34.99%	-34.57%	-32.70%	-36.68%	-35.00%	-34.84%	-37.13%	-36.43%	-35.94%	-33.03%	-31.19%	-29.97%				-40.77%	-34.04%	-32.59%	1.98%	14.93%	21.75%
Figure 03 FRA	592	638	-27.31%	-26.44%	-24.05%	-29.21%	-27.95%	-27.54%	-27.09%	-26.75%	-26.53%	-26.10%	-24.42%	-23.85%				-35.12%	-29.40%	-28.88%	2.92%	14.80%	19.64%
Figure 04 GER	1253	1136	-44.51%	-43.78%	-41.93%	-44.64%	-43.66%	-43.35%	-46.19%	-45.88%	-45.69%	-41.85%	-40.89%	-40.47%				-48.74%	-44.22%	-43.82%	-14.76%	-3.45%	0.45%
Figure 05 UK	789	759	-38.51%	-37.71%	-35.67%	-38.92%	-37.84%	-37.50%	-39.88%	-39.56%	-39.35%	-35.57%	-34.65%	-34.26%				-43.55%	-38.58%	-38.13%	-9.24%	2.20%	6.73%
Figure 06 RUS+EEU	4284	2906	-53.54%	-51.47%	-50.71%	-54.87%	-51.51%	-50.00%	-56.26%	-54.32%	-52.81%	-52.26%	-47.85%	-43.79%				-52.54%	-42.24%	-36.67%	-32.72%	-19.20%	-10.06%
Figure 07 JPN	1313	1501	-31.82%	-31.03%	-28.75%	-34.34%	-33.01%	-32.99%	-31.73%	-31.26%	-31.06%	-30.89%	-29.73%	-29.04%				-42.61%	-39.31%	-38.53%	-2.81%	13.49%	17.53%
Figure 08 RAI	1236	1630	-33.14%	-32.12%	-29.89%	-28.35%	-27.77%	-26.93%	-42.61%	-42.32%	-42.11%	-25.09%	-23.49%	-22.95%				-35.62%	-30.98%	-30.39%	21.65%	36.50%	41.13%
Figure 09 REEU	1175	1320	-14.01%	-10.25%	-9.67%	-17.30%	-10.89%	-9.29%	-23.54%	-12.93%	-6.01%	-12.60%	-3.47%	3.86%				-16.45%	-2.21%	4.95%	23.28%	40.64%	52.29%
Figure 10 LAM	2151	4086	44.75%	49.31%	55.22%	44.01%	51.89%	59.66%	40.25%	60.41%	63.96%	51.72%	64.59%	67.75%				40.14%	60.31%	65.36%	125.89%	161.70%	169.93%
Figure 11 AFR	1393	2715	115.51%	117.07%	122.10%	100.22%	113.18%	118.64%	122.95%	164.61%	175.12%	82.61%	97.64%	102.71%				62.70%	92.76%	96.08%	152.86%	203.22%	219.71%
Figure 12 ME	902	1994	61.35%	67.94%	70.52%	75.47%	90.60%	94.01%	63.61%	86.27%	94.41%	72.32%	87.99%	94.55%				72.33%	101.18%	108.12%	171.63%	207.80%	221.90%
Figure 13 SAsia	1347	2838	161.93%	176.26%	177.04%	152.03%	177.63%	188.55%	152.84%	224.40%	249.69%	67.73%	102.39%	110.39%	45.64%	129.71%	168.99%	46.98%	113.14%	125.23%	152.84%	224.40%	249.69%
Figure 14 CPAsia	3692	7000	51.91%	58.35%	61.76%	31.71%	44.98%	48.03%	25.91%	57.70%	71.65%	36.85%	60.34%	64.98%	5.11%	65.35%	92.92%	28.80%	72.03%	78.70%	97.95%	144.53%	164.59%
Figure 15 EAsia	1225	2958	103.36%	111.91%	115.75%	85.20%	105.35%	107.70%	97.07%	143.94%	158.44%	81.85%	116.03%	122.01%				61.63%	115.86%	122.48%	162.19%	225.29%	245.81%
UNFCCC Annex I	18580	19497	-33.10%	-32.79%	-31.02%	-31.10%	-29.44%	-29.23%	-41.91%	-41.17%	-40.54%	-28.88%	-26.70%	-25.26%	-46.33%	-46.33%	-46.33%	-35.55%	-29.11%	-26.96%	-0.96%	11.98%	17.77%
UNFCCC Non Annex I	11355	21648	73.98%	76.86%	77.37%	64.02%	72.41%	76.56%	69.33%	89.68%	106.91%	54.94%	69.15%	76.54%	75.05%	109.01%	138.30%	41.50%	71.88%	82.95%	132.03%	158.98%	183.59%
World total	30342	41884	9.97%	10.00%	10.02%	6.51%	10.40%	12.11%	1.45%	9.54%	16.75%	4.78%	10.71%	14.80%	-1.62%	11.09%	22.05%	-5.09%	10.08%	16.24%	51.33%	67.02%	82.82%

Table 24. Results for the calculations on 450 ppmv CO_2eq. in 2050 from Section 3.2 (Figure 8)

450 ppmv CO_2eq.	Emissions in Mt CO_2eq.		C&C 2050 Values as % of 1990 2050			CDC Values as % of 1990 2050			Multistage Values as % of 1990 2050			Triptych Values as % of 1990 2050			Sectoral Values as % of 1990 2050			Intensity Values as % of 1990 2050			Reference Values as % of 1990 2050		
Year	1990	2010																					
Country group			Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max
EVOC 01 USA	6308	7706	-88.87%	-86.73%	-86.73%	-89.79%	-88.74%	-87.85%	-94.33%	-93.74%	-93.25%	-82.15%	-79.06%	-78.73%				-75.42%	-70.12%	-67.18%	-14.98%	13.05%	38.00%
EVOC 02 EU15	4457	4848	-84.01%	-80.43%	-80.43%	-84.96%	-83.40%	-82.54%	-91.65%	-90.78%	-90.30%	-83.23%	-80.28%	-79.20%				-84.31%	-78.82%	-77.17%	-29.08%	2.96%	28.69%
EVOC 03 EU+10	991	879	-86.81%	-84.51%	-84.42%	-87.10%	-86.78%	-85.60%	-92.83%	-92.66%	-92.00%	-79.48%	-75.46%	-71.18%				-79.94%	-65.56%	-59.19%	-17.57%	14.37%	41.47%
EVOC 04 RWEU	117	130	-80.73%	-76.43%	-76.43%	-81.93%	-80.02%	-78.99%	-89.96%	-88.89%	-88.32%	-76.52%	-70.65%	-67.71%				-83.13%	-77.43%	-75.56%	-25.74%	7.13%	32.21%
EVOC 05 RUS	2839	2082	-90.00%	-88.73%	-88.73%	-90.84%	-90.44%	-87.81%	-94.91%	-94.69%	-93.23%	-88.50%	-84.46%	-81.73%				-76.78%	-60.51%	-52.76%	-28.67%	5.36%	29.14%
EVOC 06 REEU in Annex I	1445	824	-87.44%	-86.05%	-86.05%	-88.51%	-88.16%	-85.74%	-93.61%	-93.42%	-92.08%	-85.77%	-80.61%	-77.11%				-83.91%	-72.43%	-67.06%	-43.36%	-16.56%	1.91%
EVOC 07 JPN	1313	1501	-82.75%	-78.62%	-78.62%	-83.62%	-81.86%	-81.16%	-90.90%	-89.92%	-89.53%	-81.46%	-78.23%	-76.81%				-85.88%	-83.07%	-81.29%	-36.48%	-11.35%	12.34%
EVOC 08 RAI	1119	1499	-88.87%	-86.99%	-86.99%	-89.74%	-88.96%	-87.85%	-94.30%	-93.87%	-93.25%	-81.20%	-78.16%	-77.73%				-81.18%	-75.85%	-73.78%	-2.97%	27.30%	53.51%
EVOC 10 REEU	993	871	-78.95%	-76.45%	-76.45%	-79.39%	-78.35%	-73.96%	-86.25%	-85.84%	-81.78%	-77.04%	-68.54%	-63.21%				-73.53%	-54.66%	-45.62%	-10.14%	32.67%	62.41%
EVOC 11 ARG	237	412	-51.58%	-51.58%	-46.82%	-58.91%	-58.91%	-41.93%	-77.17%	-77.17%	-67.74%	-47.20%	-35.02%	-29.37%				-44.03%	-17.65%	-9.17%	137.75%	222.54%	295.64%
EVOC 12 BRZ	664	1205	-20.60%	-20.60%	-12.80%	-32.62%	-32.62%	-4.78%	-62.57%	-62.57%	-47.10%	-20.53%	-4.31%	8.28%				-41.94%	-14.10%	-5.59%	138.58%	222.99%	279.47%
EVOC 13 MEX	377	687	-18.96%	-18.96%	-11.00%	-31.23%	-31.23%	-2.81%	-61.80%	-61.80%	-46.01%	-24.38%	-11.82%	-6.09%				-37.16%	-4.76%	5.29%	140.62%	277.35%	385.57%
EVOC 14 VEN	181	346	-58.66%	-58.66%	-54.60%	-64.92%	-64.92%	-50.42%	-80.51%	-80.51%	221.38%	-32.99%	-17.23%	-12.73%				-37.64%	-9.92%	-0.22%	203.06%	307.47%	420.06%
EVOC 15 RLA	693	1434	-18.34%	-18.34%	-10.31%	-26.25%	-24.68%	3.04%	-53.01%	-39.91%	-19.17%	-18.73%	-3.43%	17.51%				-30.63%	4.03%	15.61%	158.28%	273.97%	350.57%
EVOC 16 EGY	115	254	127.17%	150.20%	176.74%	171.16%	180.90%	270.38%	81.32%	164.57%	376.22%	80.81%	124.81%	135.07%				3.91%	73.22%	90.20%	427.33%	734.55%	965.22%
EVOC 17 ZAF	335	484	-45.30%	-39.13%	-32.49%	-48.34%	-48.34%	-38.20%	-71.30%	-69.06%	296.48%	-27.85%	-16.73%	-7.26%				-35.59%	10.04%	15.91%	192.01%	324.18%	466.40%
EVOC 18 NGA	188	461	155.86%	184.75%	215.82%	203.59%	215.12%	291.96%	51.16%	125.06%	435.04%	122.85%	137.19%	147.70%				27.36%	137.60%	156.27%	698.18%	929.44%	1319.97%
EVOC 19 RNA	196	426	47.12%	62.03%	79.22%	56.03%	59.60%	117.74%	15.29%	50.64%	256.45%	17.98%	51.30%	59.98%				0.92%	70.71%	88.00%	356.96%	589.03%	754.28%
EVOC 20 RAF	560	1089	265.77%	307.07%	351.51%	313.08%	349.12%	353.73%	373.73%	408.95%	442.38%	166.86%	186.83%	196.49%				6.30%	89.72%	102.37%	577.68%	860.65%	1161.26%
EVOC 21 SAU	211	468	-63.04%	-57.55%	-54.72%	-66.17%	-63.98%	-50.56%	-81.20%	-79.99%	-72.53%	-21.96%	16.77%	34.79%				-13.48%	44.91%	60.21%	298.90%	513.71%	588.58%
EVOC 22 ARE	94	215	-89.36%	-87.78%	-86.97%	-90.26%	-89.63%	-85.77%	-94.59%	-94.24%	-92.09%	-45.93%	-11.71%	2.02%				-10.61%	49.31%	65.52%	415.88%	606.15%	736.46%
EVOC 23 RME	596	1311	-4.71%	9.43%	16.74%	-11.18%	-2.93%	28.40%	-47.21%	3.63%	189.18%	-7.05%	28.39%	37.92%				-14.09%	43.89%	59.06%	311.97%	503.10%	580.07%
EVOC 24 CHN	3504	6820	-21.31%	-21.31%	-4.41%	-33.22%	-33.22%	4.38%	-62.90%	-62.90%	-29.49%	-32.97%	-14.55%	-6.47%				-50.91%	-11.12%	1.16%	135.16%	242.83%	382.26%
EVOC 25 IND	1079	2318	189.16%	206.53%	206.53%	247.22%	263.32%	296.63%	322.84%	409.12%	643.95%	94.27%	143.30%	188.99%				-26.29%	72.86%	103.07%	463.79%	653.70%	1106.77%
EVOC 26 IDN	279	694	114.63%	115.14%	123.19%	134.38%	137.83%	209.32%	58.75%	185.91%	235.10%	41.63%	64.00%	77.51%				-25.88%	34.66%	48.95%	257.04%	378.71%	589.52%
EVOC 27 KOR	300	729	-65.89%	-65.89%	-58.57%	-71.06%	-71.06%	-54.76%	-83.92%	-83.92%	-74.87%	-42.37%	-16.95%	0.10%				-39.96%	11.08%	26.56%	232.44%	395.07%	612.29%
EVOC 28 MYS	65	155	-3.11%	-2.88%	0.75%	-17.58%	-17.58%	10.02%	-54.21%	-54.21%	-38.88%	5.49%	33.53%	69.89%				-27.78%	30.71%	43.41%	208.55%	340.42%	449.61%
EVOC 29 PHL	80	160	168.14%	168.77%	178.84%	194.00%	222.47%	247.41%	198.71%	273.03%	328.75%	64.40%	99.15%	114.73%				-39.87%	8.77%	20.21%	237.27%	349.03%	538.32%
EVOC 30 SGP	30	73	-62.27%	-62.18%	-60.77%	-67.91%	-67.91%	-57.16%	-82.17%	-81.49%	620.26%	-10.20%	51.69%	97.32%				-28.25%	32.73%	46.45%	375.25%	574.28%	928.94%
EVOC 31 THA	170	405	4.57%	4.82%	8.74%	-11.05%	-11.05%	18.75%	-50.58%	-50.58%	-34.03%	18.14%	48.85%	78.41%				-28.41%	29.28%	43.09%	295.52%	415.93%	668.66%
EVOC 32 RAA	757	1437	115.89%	119.66%	119.79%	92.37%	125.17%	141.93%	88.25%	154.04%	193.93%	38.75%	61.56%	82.23%				-5.28%	40.37%	72.65%	211.21%	309.52%	486.60%
Figure 01 USA	6308	7706	-88.87%	-86.73%	-86.73%	-89.79%	-88.74%	-87.85%	-94.33%	-93.74%	-93.25%	-82.15%	-79.06%	-78.73%				-75.42%	-70.12%	-67.18%	-14.98%	13.05%	38.00%
Figure 02 EU25	5448	5727	-84.53%	-81.17%	-81.15%	-85.35%	-84.01%	-83.10%	-91.86%	-91.12%	-90.61%	-82.54%	-79.41%	-77.75%				-83.51%	-76.41%	-73.91%	-23.79%	5.03%	31.01%
Figure 03 FRA	592	638	-80.48%	-76.12%	-76.12%	-81.67%	-79.73%	-78.68%	-89.82%	-88.74%	-88.16%	-83.92%	-79.92%	-78.52%				-82.95%	-76.98%	-75.18%	-25.12%	7.08%	30.68%
Figure 04 GER	1253	1136	-87.67%	-84.92%	-84.92%	-88.42%	-87.20%	-86.54%	-93.57%	-92.89%	-92.52%	-84.66%	-82.27%	-81.37%				-86.53%	-81.81%	-80.39%	-43.04%	-16.59%	6.03%
Figure 05 UK	789	759	-85.81%	-82.64%	-82.64%	-86.68%	-85.27%	-84.50%	-92.60%	-91.82%	-91.39%	-85.32%	-82.86%	-82.02%				-85.16%	-79.97%	-78.41%	-38.05%	-10.11%	12.43%
Figure 06 RUS+EEU	4284	2906	-89.14%	-87.83%	-87.83%	-90.05%	-89.67%	-87.11%	-94.47%	-94.26%	-92.84%	-87.58%	-83.16%	-80.20%				-79.18%	-64.53%	-57.58%	-33.62%	-2.03%	19.95%
Figure 07 JPN	1313	1501	-82.75%	-78.62%	-78.62%	-83.62%	-81.86%	-81.16%	-90.90%	-89.92%	-89.53%	-81.46%	-78.23%	-76.81%				-85.88%	-83.07%	-81.29%	-36.48%	-11.35%	12.34%
Figure 08 RAI	1236	1630	-88.10%	-85.99%	-85.99%	-89.00%	-88.11%	-87.01%	-93.89%	-93.39%	-92.78%	-80.76%	-77.45%	-76.78%				-81.37%	-76.00%	-73.95%	-4.06%	25.55%	51.49%
Figure 09 REEU	1175	1320	-60.45%	-55.10%	-54.15%	-62.66%	-60.49%	-48.87%	-77.10%	-76.25%	-9.16%	-58.21%	-40.55%	-32.34%				-59.34%	-36.78%	-26.76%	52.21%	114.52%	150.07%
Figure 10 LAM	2151	4086	-26.19%	-26.19%	-18.94%	-35.93%	-35.43%	-9.84%	-62.47%	-57.69%	-17.62%	-24.33%	-9.37%	1.79%				-37.33%	-6.66%	3.20%	150.61%	261.00%	334.57%
Figure 11 AFR	1393	2715	142.61%	159.99%	179.65%	163.99%	181.51%	206.34%	164.10%	196.57%	283.30%	91.62%	104.45%	116.62%				2.26%	73.01%	85.80%	457.87%	688.73%	942.37%
Figure 12 ME	902	1994	-27.22%	-16.42%	-10.84%	-32.32%	-26.29%	-2.02%	-60.12%	-26.19%	96.50%	-14.60%	20.17%	33.44%				-13.59%	44.69%	60.00%	319.75%	516.34%	598.38%
Figure 13 SAsia	1347	2838	210.98%	229.66%	229.66%	246.54%	278.16%	294.28%	319.42%	396.38%	611.40%	101.86%	146.48%	189.63%				-23.80%	72.72%	103.58%	441.29%	612.77%	1034.52%
Figure 14 CPAsia	3692	7000	-23.84%	-23.84%	-7.49%	-35.37%	-35.37%	1.02%	-64.10%	-64.10%	-31.99%	-34.61%	-16.51%	-8.33%				-45.77%	-8.92%	5.44%	128.29%	233.49%	368.29%
Figure 15 EAsia	1225	2958	34.41%	34.41%	41.41%	38.15%	43.71%	77.92%	27.23%	46.86%	65.39%	13.76%	36.23%	57.27%				-32.34%	22.78%	37.10%	247.58%	378.39%	580.56%
UNFCCC Annex I	18580	19497	-86.98%	-84.75%	-84.74%	-88.07%	-87.05%	-85.78%	-93.37%	-92.81%	-92.10%	-83.39%	-79.97%	-78.55%				-79.82%	-72.02%	-68.43%	-19.77%	8.71%	30.73%
UNFCCC Non Annex I	11355	21648	30.68%	30.68%	34.71%	27.22%	33.76%	61.16%	23.84%	44.58%	81.89%	4.81%	22.99%	35.73%				-31.14%	11.73%	29.35%	250.86%	359.04%	526.85%
World total	30342	41884	-40.02%	-40.00%	-39.99%	-43.01%	-40.46%	-29.04%	-48.38%	-40.20%	-26.51%	-48.41%	-39.52%	-33.56%				-60.47%	-39.07%	-29.95%	85.81%	146.05%	223.70%

Table 25. Results for the calculations on 550 ppmv CO_2eq. in 2020 from Section 3.2 (Figure 10 and Figure 11)

550 ppmv CO_2eq. Year	Emissions in Mt CO_2eq. 1990	2010	C&C 2050 convergence Values as % of 1990 2020			CDC Values as % of 1990 2020			Multistage (per capita) Values as % of 1990 2020			Triptych Values as % of 1990 2020			Sectoral Values as % of 1990 2020			Intensity Values as % of 1990 2020			Reference Values as % of 1990 2020		
Country group			Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max
EVOC 01 USA	6308	7706	-5.07%	-3.52%	-0.32%	2.04%	2.29%	3.34%	-18.86%	-18.69%	-18.46%	-2.57%	-0.29%	0.01%				-2.86%	2.54%	3.74%	13.93%	23.76%	29.15%
EVOC 02 EU15	4457	4848	-22.42%	-21.44%	-18.88%	-26.04%	-24.74%	-24.31%	-24.99%	-24.79%	-24.65%	-25.39%	-23.55%	-22.75%				-29.40%	-23.18%	-22.61%	2.95%	15.95%	20.81%
EVOC 03 EU+10	991	879	-30.19%	-27.05%	-26.25%	-35.13%	-31.34%	-29.49%	-34.18%	-31.22%	-29.21%	-30.07%	-23.96%	-18.47%				-32.33%	-16.53%	-9.56%	-6.04%	10.37%	26.02%
EVOC 04 RWEU	117	130	-16.48%	-15.48%	-12.74%	-21.43%	-20.01%	-19.54%	-19.70%	-19.49%	-19.36%	107.83%	147.05%	172.96%				-25.42%	-18.89%	-18.26%	5.24%	17.68%	22.79%
EVOC 05 RUS	2839	2082	-41.83%	-39.14%	-38.18%	-44.74%	-40.44%	-38.67%	-45.52%	-43.07%	-41.11%	-43.35%	-36.87%	-31.39%				-38.80%	-25.74%	-18.54%	-27.95%	-13.27%	-3.51%
EVOC 06 REEU in Annex I	1445	824	-51.50%	-49.55%	-48.74%	-55.94%	-53.06%	-51.59%	-54.44%	-52.11%	-49.89%	-52.65%	-47.06%	-41.60%				-53.78%	-43.33%	-37.94%	-42.09%	-30.85%	-22.93%
EVOC 07 JPN	1313	1501	-19.43%	-18.50%	-15.80%	-24.91%	-23.37%	-23.33%	-21.54%	-21.25%	-21.13%	-23.99%	-22.11%	-21.09%				-32.11%	-28.20%	-27.28%	-2.81%	13.49%	17.53%
EVOC 08 RAI	1119	1499	-21.46%	-20.23%	-17.60%	-18.37%	-17.78%	-16.77%	-29.09%	-28.90%	-28.75%	-19.15%	-17.05%	-16.64%				-23.68%	-18.30%	-17.60%	23.26%	38.37%	43.57%
EVOC 10 REEU	993	871	-24.51%	-20.84%	-19.33%	-30.43%	-25.03%	-22.14%	-39.42%	-28.75%	-22.04%	-27.51%	-18.39%	-9.96%				-27.80%	-11.60%	-2.74%	-12.29%	5.36%	17.50%
EVOC 11 ARG	237	412	47.20%	51.24%	57.51%	48.00%	55.29%	63.50%	46.87%	53.02%	71.33%	53.89%	68.52%	71.35%	107.51%	139.39%	147.52%	51.70%	71.99%	77.30%	114.61%	146.21%	154.23%
EVOC 12 BRZ	664	1205	68.36%	72.98%	80.80%	59.57%	67.56%	77.64%	64.94%	88.65%	93.70%	74.51%	90.37%	97.77%	102.69%	132.27%	147.24%	57.37%	79.44%	84.28%	112.77%	141.41%	147.24%
EVOC 13 MEX	377	687	69.47%	75.51%	81.21%	60.17%	69.47%	77.43%	63.53%	98.51%	114.22%	70.31%	85.03%	95.10%	67.22%	110.46%	128.38%	60.80%	85.50%	91.62%	113.37%	154.30%	170.67%
EVOC 14 VEN	181	346	57.22%	59.62%	67.90%	60.40%	67.89%	78.61%	54.06%	79.14%	88.48%	77.21%	94.02%	97.18%				69.01%	88.11%	94.77%	158.14%	198.47%	213.84%
EVOC 15 RLA	693	1434	86.29%	93.47%	100.10%	102.82%	117.42%	120.87%	86.90%	114.31%	118.92%	91.81%	113.27%	115.30%				80.25%	107.82%	114.81%	140.72%	179.34%	187.13%
EVOC 16 EGY	115	254	167.00%	175.10%	177.88%	189.55%	236.67%	257.19%	189.55%	236.67%	257.19%	138.12%	158.59%	172.71%				115.70%	150.62%	157.35%	189.55%	236.67%	257.19%
EVOC 17 ZAF	335	484	30.53%	30.95%	36.36%	44.32%	44.65%	44.93%	17.18%	36.73%	44.54%	44.67%	55.11%	61.87%	-0.28%	34.24%	48.58%	39.07%	63.18%	63.81%	69.88%	96.15%	106.02%
EVOC 18 NGA	188	461	195.90%	202.53%	212.29%	197.32%	287.64%	313.58%	197.32%	287.64%	313.58%	164.34%	192.06%	207.49%				137.40%	194.09%	202.29%	197.32%	287.64%	313.58%
EVOC 19 RNA	196	426	123.75%	133.19%	134.55%	124.73%	146.89%	153.87%	118.67%	160.94%	180.89%	111.85%	132.07%	144.30%				109.50%	146.90%	154.37%	168.86%	217.93%	240.51%
EVOC 20 RAF	560	1089	217.03%	221.01%	227.85%	166.62%	213.80%	226.60%	166.18%	216.35%	230.19%	139.50%	157.91%	165.25%				94.71%	133.24%	136.03%	174.46%	226.92%	241.24%
EVOC 21 SAU	211	468	73.54%	80.44%	83.35%	93.42%	109.80%	113.57%	62.29%	85.59%	94.29%	104.65%	126.68%	139.97%	63.92%	104.39%	121.69%	104.11%	138.37%	146.53%	173.26%	209.24%	222.60%
EVOC 22 ARE	94	215	65.97%	72.46%	75.33%	94.71%	111.43%	114.91%	56.74%	79.26%	90.22%	97.45%	116.80%	128.71%				110.90%	145.56%	154.69%	184.30%	222.78%	241.69%
EVOC 23 RME	596	1311	100.67%	108.97%	112.11%	110.86%	131.60%	134.19%	94.82%	121.84%	132.60%	102.07%	121.82%	131.78%				102.68%	136.68%	144.76%	169.06%	204.92%	218.61%
EVOC 24 CHN	3504	6820	84.66%	92.46%	96.57%	83.20%	90.00%	106.28%	100.40%	108.21%	147.22%	65.25%	94.82%	104.44%	39.64%	99.65%	125.57%	54.46%	107.28%	115.25%	103.57%	151.33%	172.13%
EVOC 25 IND	1079	2318	199.31%	217.26%	218.29%	158.64%	235.28%	262.27%	158.64%	235.28%	262.27%	108.87%	164.40%	186.92%	82.20%	168.44%	205.81%	75.04%	156.08%	170.97%	158.64%	235.28%	262.27%
EVOC 26 IDN	279	694	188.82%	199.17%	204.87%	170.09%	239.00%	254.16%	170.09%	239.00%	254.16%	127.91%	170.92%	186.07%	170.09%	191.54%	212.01%	97.68%	162.55%	169.41%	170.09%	239.00%	254.16%
EVOC 27 KOR	300	729	85.29%	98.24%	102.08%	76.89%	99.26%	103.67%	54.60%	97.71%	119.61%	88.95%	138.03%	151.19%	110.91%	183.59%	221.69%	88.91%	159.09%	169.30%	159.34%	228.63%	262.93%
EVOC 28 MYS	65	155	117.32%	126.52%	134.75%	97.53%	116.72%	121.61%	99.00%	151.73%	158.59%	106.14%	146.74%	165.31%				92.61%	155.00%	159.39%	158.69%	223.24%	230.53%
EVOC 29 PHL	80	160	187.34%	195.03%	199.14%	121.66%	174.70%	186.91%	121.66%	174.70%	186.91%	104.76%	139.50%	151.25%				60.39%	112.05%	117.42%	121.66%	174.70%	186.91%
EVOC 30 SGP	30	73	82.30%	96.41%	104.12%	82.91%	107.62%	111.68%	62.23%	114.71%	128.61%	101.50%	160.68%	177.51%				91.36%	158.92%	164.88%	172.24%	257.62%	276.74%
EVOC 31 THA	170	405	120.31%	130.40%	135.31%	99.24%	118.86%	123.02%	110.82%	161.27%	170.50%	119.08%	168.14%	184.12%	87.65%	171.21%	192.74%	90.93%	152.02%	158.82%	163.81%	227.26%	242.36%
EVOC 32 RAA	757	1437	148.88%	156.82%	158.61%	90.78%	121.13%	129.27%	84.50%	120.91%	134.67%	78.90%	111.02%	123.51%				61.35%	114.13%	123.13%	112.30%	155.29%	171.79%
Figure 01 USA	6308	7706	-5.07%	-3.52%	-0.32%	2.04%	2.29%	3.34%	-18.86%	-18.69%	-18.46%	-2.57%	-0.29%	0.01%				-2.86%	2.54%	3.74%	13.93%	23.76%	29.15%
Figure 02 EU25	5448	5727	-23.17%	-22.68%	-20.46%	-27.70%	-25.77%	-25.60%	-26.67%	-25.97%	-25.48%	-26.25%	-23.65%	-21.97%				-29.93%	-21.97%	-20.25%	1.98%	14.93%	21.75%
Figure 03 FRA	592	638	-14.10%	-13.06%	-10.24%	-19.03%	-17.57%	-17.09%	-16.34%	-16.14%	-16.01%	-19.43%	-16.47%	-15.19%				-23.24%	-16.48%	-15.87%	2.92%	14.80%	19.64%
Figure 04 GER	1253	1136	-34.42%	-33.56%	-31.37%	-36.88%	-35.75%	-35.39%	-36.57%	-36.38%	-36.26%	-35.75%	-34.27%	-33.64%				-39.36%	-34.02%	-33.53%	-14.76%	-3.45%	0.45%
Figure 05 UK	789	759	-27.33%	-26.39%	-23.97%	-30.32%	-29.08%	-28.67%	-29.53%	-29.33%	-29.20%	-29.99%	-28.59%	-27.98%				-33.22%	-27.33%	-26.80%	-9.24%	2.20%	6.73%
Figure 06 RUS+EEU	4284	2906	-45.09%	-42.65%	-41.74%	-48.52%	-44.70%	-43.03%	-48.49%	-46.12%	-44.07%	-46.48%	-40.31%	-34.83%				-43.86%	-31.67%	-25.08%	-32.72%	-19.20%	-10.06%
Figure 07 JPN	1313	1501	-19.43%	-18.50%	-15.80%	-24.91%	-23.37%	-23.33%	-21.54%	-21.25%	-21.13%	-23.99%	-22.11%	-21.09%				-32.11%	-28.20%	-27.28%	-2.81%	13.49%	17.53%
Figure 08 RAI	1236	1630	-20.98%	-19.78%	-17.14%	-18.66%	-17.99%	-17.03%	-28.20%	-28.01%	-27.86%	-7.08%	-1.47%	1.37%				-23.84%	-18.36%	-17.66%	21.65%	36.50%	41.13%
Figure 09 REEU	1175	1320	1.63%	6.07%	6.76%	-4.42%	2.90%	4.75%	-10.41%	0.79%	7.70%	0.09%	11.60%	20.71%				-1.16%	15.69%	24.16%	23.28%	40.64%	52.29%
Figure 10 LAM	2151	4086	71.06%	76.46%	83.44%	72.56%	82.62%	90.05%	68.86%	95.05%	100.04%	77.30%	95.82%	98.00%				65.69%	89.55%	95.51%	125.89%	161.70%	169.93%
Figure 11 AFR	1393	2715	154.69%	156.54%	162.48%	137.38%	175.43%	186.91%	129.82%	176.69%	192.10%	116.97%	134.24%	143.72%				92.42%	127.97%	131.88%	152.86%	203.22%	219.71%
Figure 12 ME	902	1994	90.69%	98.47%	101.53%	105.08%	124.38%	127.34%	83.22%	108.90%	119.19%	102.19%	122.43%	133.38%				103.88%	138.00%	146.21%	171.63%	207.80%	221.90%
Figure 13 SAsia	1347	2838	209.55%	226.49%	227.41%	152.84%	224.40%	249.69%	152.84%	224.40%	249.69%	109.51%	162.59%	184.26%	78.11%	159.73%	195.19%	73.46%	151.64%	165.93%	152.84%	224.40%	249.69%
Figure 14 CPAsia	3692	7000	79.53%	87.14%	91.17%	77.65%	84.53%	99.95%	94.60%	101.90%	139.18%	59.84%	88.24%	97.46%	35.78%	94.25%	119.32%	51.61%	102.62%	110.48%	97.95%	144.53%	164.59%
Figure 15 EAsia	1225	2958	140.33%	150.43%	154.97%	118.60%	153.95%	159.13%	111.66%	159.48%	175.25%	112.95%	156.85%	171.24%				91.20%	155.36%	163.18%	162.19%	225.29%	245.81%
UNFCCC Annex I	18580	19497	-20.93%	-20.57%	-18.47%	-21.65%	-19.75%	-19.53%	-28.79%	-27.99%	-27.27%	-21.40%	-18.02%	-15.91%	-25.76%	-25.76%	-25.76%	-23.75%	-16.14%	-13.59%	-0.96%	11.98%	17.77%
UNFCCC Non Annex I	11355	21648	105.61%	109.02%	109.62%	98.22%	110.47%	119.30%	102.89%	119.58%	131.61%	83.32%	102.13%	115.29%	93.62%	126.54%	154.34%	67.12%	103.03%	116.10%	132.03%	158.98%	183.59%
World total	30342	41884	29.96%	30.00%	30.02%	25.62%	30.85%	34.57%	22.46%	29.25%	34.62%	20.67%	28.60%	35.64%	17.92%	30.24%	40.65%	12.16%	30.10%	37.36%	51.33%	67.02%	82.82%

Table 26. Results for the calculations on 550 ppmv CO_2eq. in 2050 from Section 3.2 (Figure 10)

550 ppmv CO_2eq.	Emissions in Mt CO_2eq.		C&C 2050 convergence Values as % of 1990			CDC Values as % of 1990			Multistage (per capita) Values as % of 1990			Triptych Values as % of 1990			Sectoral Values as % of 1990			Intensity Values as % of 1990			Reference Values as % of 1990		
Year	1990	2010	2050			2050			2050			2050			2050			2050			2050		
Country group			Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max
EVOC 01 USA	6308	7706	-83.31%	-80.09%	-80.09%	-85.25%	-83.73%	-82.45%	-91.49%	-90.58%	-89.88%	-73.55%	-69.28%	-68.80%				-63.51%	-55.65%	-51.29%	-14.98%	13.05%	38.00%
EVOC 02 EU15	4457	4848	-76.02%	-70.65%	-70.65%	-78.28%	-76.02%	-74.79%	-87.46%	-86.10%	-85.43%	-75.62%	-71.32%	-69.80%				-76.71%	-68.56%	-66.11%	-29.08%	2.96%	28.69%
EVOC 03 EU+10	991	879	-80.22%	-76.76%	-76.63%	-81.36%	-80.90%	-79.20%	-89.22%	-88.50%	-87.82%	-69.74%	-63.92%	-57.29%				-70.22%	-48.88%	-39.42%	-17.57%	14.37%	41.47%
EVOC 04 RWEU	117	130	-71.09%	-64.64%	-64.64%	-73.91%	-71.15%	-69.65%	-84.94%	-83.28%	-82.49%	-65.59%	-56.98%	-52.65%				-75.15%	-66.64%	-63.93%	-25.74%	7.13%	32.21%
EVOC 05 RUS	2839	2082	-84.99%	-83.10%	-83.10%	-86.77%	-86.19%	-82.40%	-92.37%	-91.74%	-89.84%	-82.89%	-76.21%	-71.89%				-65.52%	-41.38%	-29.87%	-28.67%	5.36%	29.14%
EVOC 06 REEU in Annex I	1445	824	-81.17%	-79.07%	-79.07%	-83.40%	-82.90%	-79.41%	-89.96%	-89.71%	-88.04%	-79.28%	-71.43%	-66.21%				-76.11%	-59.07%	-51.10%	-43.36%	-16.56%	1.91%
EVOC 07 JPN	1313	1501	-74.12%	-67.93%	-67.93%	-76.34%	-73.80%	-72.79%	-86.35%	-84.86%	-84.30%	-73.51%	-69.13%	-67.20%				-79.04%	-74.87%	-72.23%	-36.48%	-11.35%	12.34%
EVOC 08 RAI	1119	1499	-83.31%	-80.48%	-80.48%	-85.19%	-84.05%	-82.45%	-91.45%	-90.63%	-89.87%	-72.70%	-67.83%	-67.13%				-72.07%	-64.15%	-61.08%	-2.97%	27.30%	53.51%
EVOC 10 REEU	993	871	-68.43%	-64.67%	-64.67%	-71.20%	-69.09%	-63.59%	-77.23%	-76.33%	-69.85%	-65.91%	-52.80%	-44.56%				-60.70%	-32.69%	-19.27%	-10.14%	32.67%	62.41%
EVOC 11 ARG	237	412	-27.37%	-27.37%	-20.23%	-40.65%	-40.65%	-16.12%	-65.76%	0.33%	157.96%	-21.37%	-2.43%	5.22%				-16.91%	22.25%	34.84%	137.75%	222.54%	295.64%
EVOC 12 BRZ	664	1205	19.09%	19.09%	30.80%	-2.68%	-2.68%	37.54%	-42.70%	14.68%	161.71%	18.89%	44.16%	61.92%				-13.80%	27.53%	40.15%	138.58%	222.99%	279.47%
EVOC 13 MEX	377	687	21.55%	21.55%	33.50%	-0.67%	-0.67%	40.38%	-42.69%	-34.91%	162.73%	11.47%	30.44%	40.01%				-6.71%	41.39%	56.31%	140.62%	277.35%	385.57%
EVOC 14 VEN	181	346	-37.99%	-37.99%	-31.90%	-49.32%	-49.32%	-28.38%	-70.76%	-69.72%	-58.68%	-1.98%	22.14%	30.44%				-7.43%	33.72%	48.13%	203.06%	307.47%	420.06%
EVOC 15 RLA	693	1434	22.50%	22.50%	34.53%	14.44%	23.20%	58.84%	7.55%	26.24%	82.49%	20.85%	43.99%	80.14%				2.17%	53.43%	70.23%	158.28%	273.97%	350.57%
EVOC 16 EGY	115	254	240.76%	275.30%	315.11%	308.56%	344.01%	490.67%	321.86%	483.90%	572.36%	170.55%	235.10%	251.98%				54.26%	157.15%	182.36%	427.33%	734.55%	965.22%
EVOC 17 ZAF	335	484	-17.96%	-8.69%	1.27%	-25.39%	-25.39%	-10.73%	-56.95%	-56.75%	-48.50%	9.28%	26.86%	41.49%				-4.38%	63.36%	72.07%	192.01%	324.18%	466.40%
EVOC 18 NGA	188	461	283.80%	327.13%	373.74%	372.52%	389.65%	468.77%	174.70%	568.30%	634.78%	238.07%	260.41%	277.75%				89.06%	252.72%	280.44%	698.18%	929.44%	1319.97%
EVOC 19 RNA	196	426	120.67%	143.04%	168.83%	123.38%	148.36%	218.07%	96.63%	122.31%	327.56%	73.45%	122.95%	137.08%				49.82%	153.42%	179.09%	356.96%	589.03%	754.28%
EVOC 20 RAF	560	1089	448.65%	510.61%	577.26%	440.99%	512.40%	551.29%	466.15%	556.69%	644.48%	299.37%	330.98%	342.69%				56.56%	180.22%	198.45%	577.68%	860.65%	1161.26%
EVOC 21 SAU	211	468	-44.56%	-36.33%	-32.08%	-51.13%	-47.97%	-28.58%	-71.81%	-69.98%	-58.80%	14.96%	74.30%	101.99%				28.43%	115.12%	137.84%	298.90%	513.71%	588.58%
EVOC 22 ARE	94	215	-84.04%	-81.67%	-80.45%	-85.93%	-85.02%	-79.44%	-91.88%	-91.12%	-88.14%	-19.93%	32.60%	53.69%				32.70%	121.65%	145.72%	415.88%	606.15%	736.46%
EVOC 23 RME	596	1311	42.93%	64.15%	75.11%	31.79%	45.04%	91.71%	3.64%	27.40%	125.11%	37.09%	90.86%	105.71%				27.53%	113.60%	136.13%	311.97%	503.10%	580.07%
EVOC 24 CHN	3504	6820	18.04%	18.04%	43.38%	8.23%	14.51%	97.49%	-38.47%	28.02%	154.30%	0.39%	28.72%	41.36%				-27.13%	31.94%	50.17%	135.16%	242.83%	382.26%
EVOC 25 IND	1079	2318	333.74%	359.79%	359.79%	410.57%	458.30%	475.29%	361.90%	544.22%	759.23%	188.05%	265.04%	335.33%				9.42%	156.61%	201.46%	463.79%	653.70%	1106.77%
EVOC 26 IDN	279	694	221.94%	222.71%	234.79%	247.54%	294.59%	306.28%	185.63%	309.81%	451.62%	110.32%	142.38%	163.00%				10.03%	99.90%	121.12%	257.04%	378.71%	589.52%
EVOC 27 KOR	300	729	-48.84%	-48.84%	-37.86%	-58.19%	-58.19%	-34.65%	-74.47%	-71.86%	-62.30%	-18.25%	25.19%	59.54%				-10.87%	64.89%	87.89%	232.44%	395.07%	612.29%
EVOC 28 MYS	65	155	45.33%	45.68%	51.13%	19.05%	19.05%	58.92%	-26.72%	-21.27%	164.72%	54.73%	98.88%	155.42%				7.21%	94.04%	112.90%	208.55%	340.42%	449.61%
EVOC 29 PHL	80	160	302.21%	303.16%	318.25%	237.27%	333.95%	388.99%	237.27%	299.05%	410.66%	142.30%	196.15%	220.05%				-10.73%	61.47%	78.45%	237.27%	349.03%	538.32%
EVOC 30 SGP	30	73	-43.41%	-43.28%	-41.15%	-53.65%	-53.65%	-38.12%	-73.26%	-71.19%	-64.30%	32.80%	128.35%	198.80%				6.51%	97.04%	117.41%	375.25%	574.28%	928.94%
EVOC 31 THA	170	405	56.86%	57.23%	63.12%	28.49%	33.38%	93.14%	-20.89%	-14.52%	247.58%	75.97%	124.67%	170.58%				6.27%	91.92%	112.43%	295.52%	415.93%	668.66%
EVOC 32 RAA	757	1437	223.83%	229.49%	229.68%	138.64%	180.50%	226.45%	121.14%	177.70%	249.12%	102.67%	137.06%	167.58%				19.50%	89.19%	129.56%	211.21%	309.52%	486.60%
Figure 01 USA	6308	7706	-83.31%	-80.09%	-80.09%	-85.25%	-83.73%	-82.45%	-91.49%	-90.58%	-89.88%	-73.55%	-69.28%	-68.80%				-63.51%	-55.65%	-51.29%	-14.98%	13.05%	38.00%
Figure 02 EU25	5448	5727	-76.79%	-71.76%	-71.73%	-78.84%	-76.90%	-75.59%	-87.78%	-86.53%	-85.87%	-74.54%	-69.98%	-67.53%				-75.53%	-64.99%	-61.27%	-23.79%	5.03%	31.01%
Figure 03 FRA	592	638	-70.72%	-64.18%	-64.18%	-73.52%	-70.73%	-69.21%	-84.73%	-83.11%	-82.24%	-76.90%	-71.40%	-69.58%				-74.68%	-65.82%	-63.15%	-25.12%	7.08%	30.68%
Figure 04 GER	1253	1136	-81.51%	-77.38%	-77.38%	-83.28%	-81.51%	-80.55%	-90.35%	-89.26%	-88.78%	-77.15%	-73.78%	-72.56%				-80.00%	-73.00%	-70.89%	-43.04%	-16.59%	6.03%
Figure 05 UK	789	759	-78.72%	-73.96%	-73.96%	-80.76%	-78.72%	-77.62%	-88.90%	-87.68%	-87.09%	-78.59%	-75.16%	-74.04%				-77.97%	-70.26%	-67.94%	-38.05%	-10.11%	12.43%
Figure 06 RUS+EEU	4284	2906	-83.70%	-81.74%	-81.74%	-85.63%	-85.08%	-81.39%	-91.55%	-91.10%	-89.24%	-81.67%	-74.60%	-70.00%				-69.09%	-47.35%	-37.03%	-33.62%	-2.03%	19.95%
Figure 07 JPN	1313	1501	-74.12%	-67.93%	-67.93%	-76.34%	-73.80%	-72.79%	-86.35%	-84.86%	-84.30%	-73.51%	-69.13%	-67.20%				-79.04%	-74.87%	-72.23%	-36.48%	-11.35%	12.34%
Figure 08 RAI	1236	1630	-82.15%	-78.98%	-78.98%	-84.12%	-82.83%	-81.23%	-90.84%	-89.93%	-89.17%	-72.02%	-66.80%	-65.76%				-72.36%	-64.39%	-61.35%	-4.06%	25.55%	51.49%
Figure 09 REEU	1175	1320	-40.67%	-32.65%	-31.22%	-42.52%	-39.17%	-24.91%	-57.76%	-42.54%	0.90%	-37.58%	-10.49%	2.31%				-39.65%	-6.15%	8.72%	52.21%	114.52%	150.07%
Figure 10 LAM	2151	4086	10.71%	10.71%	21.59%	-4.91%	-2.09%	33.45%	-28.12%	1.68%	117.45%	12.63%	35.52%	53.22%				-7.22%	38.24%	52.76%	150.61%	261.00%	334.57%
Figure 11 AFR	1393	2715	263.91%	289.99%	319.47%	267.50%	311.72%	324.34%	302.75%	330.38%	380.40%	187.27%	207.01%	225.06%				51.32%	156.26%	175.03%	457.87%	688.73%	942.37%
Figure 12 ME	902	1994	9.17%	25.37%	33.75%	0.06%	9.66%	45.65%	-24.02%	-7.80%	59.74%	25.95%	78.81%	99.41%				28.28%	114.80%	137.53%	319.75%	516.34%	598.38%
Figure 13 SAsia	1347	2838	366.47%	394.49%	394.49%	394.95%	444.85%	481.73%	346.95%	515.46%	715.11%	198.57%	268.78%	335.12%				11.12%	154.17%	199.10%	441.29%	612.77%	1034.52%
Figure 14 CPAsia	3692	7000	14.24%	14.24%	38.76%	4.52%	10.51%	90.32%	-40.44%	23.66%	147.03%	-2.64%	24.96%	37.29%				-23.07%	32.18%	52.21%	128.29%	233.49%	368.29%
Figure 15 EAsia	1225	2958	101.61%	101.61%	112.12%	85.74%	117.46%	127.49%	76.07%	105.11%	143.77%	68.31%	103.99%	138.93%				0.38%	82.20%	103.45%	247.58%	378.39%	580.56%
UNFCCC Annex I	18580	19497	-80.47%	-77.12%	-77.12%	-82.77%	-81.30%	-79.46%	-90.02%	-89.08%	-88.13%	-75.63%	-70.57%	-68.43%				-70.04%	-58.46%	-53.13%	-19.77%	8.71%	30.73%
UNFCCC Non Annex I	11355	21648	96.03%	96.03%	102.06%	87.89%	101.93%	137.94%	97.78%	114.40%	182.56%	56.13%	84.03%	103.89%				0.95%	64.94%	90.46%	250.86%	359.04%	526.85%
World total	30342	41884	-10.02%	-10.00%	-9.98%	-15.98%	-10.56%	4.58%	-17.27%	-10.52%	17.16%	-23.39%	-9.81%	-0.56%				-41.89%	-10.01%	3.25%	85.81%	146.05%	223.70%

Table 27. Results for the calculations on 650 ppmv CO_2eq. in 2020 from Section 3.2 (Figure 12 and Figure 13)

650 ppmv CO_2eq.	Emissions in Mt CO_2eq.		C&C 2050 convergence Values as % of 1990 2020			CDC Values as % of 1990 2020			Multistage (per capita) Values as % of 1990 2020			Triptych Values as % of 1990 2020			Sectoral Values as % of 1990 2020			Intensity Values as % of 1990 2020			Reference Values as % of 1990 2020		
Year	1990	2010																								
Country group			Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max
EVOC 01 USA	6308	7706	9.54%	11.32%	15.01%	9.96%	10.28%	11.53%	11.62%	11.66%	11.73%	4.45%	7.18%	7.49%				12.27%	18.51%	19.91%	13.93%	23.76%	29.15%
EVOC 02 EU15	4457	4848	-10.49%	-9.35%	-6.40%	-12.90%	-11.23%	-10.57%	-12.03%	-11.98%	-11.95%	-17.02%	-14.66%	-13.71%				-18.40%	-11.21%	-10.55%	2.95%	15.95%	20.81%
EVOC 03 EU+10	991	879	-19.45%	-15.83%	-14.90%	-23.90%	-19.60%	-17.84%	-22.24%	-18.38%	-15.77%	-22.09%	-14.92%	-8.28%				-21.78%	-3.52%	4.53%	-6.04%	10.37%	26.02%
EVOC 04 RWEU	117	130	-3.63%	-2.47%	0.69%	-5.65%	-3.79%	-3.04%	-7.07%	-7.01%	-6.98%	149.29%	200.29%	234.10%				-13.86%	-6.31%	-5.59%	5.24%	17.68%	22.79%
EVOC 05 RUS	2839	2082	-32.88%	-29.77%	-28.67%	-36.95%	-32.21%	-30.65%	-33.93%	-30.67%	-27.72%	-37.79%	-30.29%	-24.02%				-29.27%	-14.17%	-5.85%	-27.95%	-13.27%	-3.51%
EVOC 06 REEU in Annex I	1445	824	-44.03%	-41.79%	-40.86%	-45.62%	-42.40%	-41.10%	-47.94%	-45.14%	-42.47%	-45.82%	-38.99%	-32.48%				-46.58%	-34.50%	-28.27%	-42.09%	-30.85%	-22.93%
EVOC 07 JPN	1313	1501	-7.03%	-5.96%	-2.84%	-10.16%	-8.09%	-7.90%	-9.60%	-9.52%	-9.50%	-13.87%	-11.51%	-10.31%				-21.53%	-17.02%	-15.95%	-2.81%	13.49%	17.53%
EVOC 08 RAI	1119	1499	-9.37%	-7.96%	-4.93%	-10.26%	-9.55%	-8.31%	-7.72%	-7.66%	-7.62%	-12.14%	-9.38%	-8.82%				-11.79%	-5.58%	-4.76%	23.26%	38.37%	43.57%
EVOC 10 REEU	993	871	-12.90%	-8.66%	-6.92%	-17.35%	-10.65%	-6.91%	-27.73%	-15.26%	-7.61%	-17.30%	-6.62%	3.03%				-16.55%	2.17%	12.41%	-12.29%	5.36%	17.50%
EVOC 11 ARG	237	412	69.84%	74.51%	81.75%	78.06%	85.02%	96.19%	76.25%	86.00%	105.60%	75.01%	92.04%	95.42%	114.61%	146.21%	154.23%	75.34%	98.78%	104.93%	114.61%	146.21%	154.23%
EVOC 12 BRZ	664	1205	94.26%	99.59%	108.62%	112.77%	141.41%	147.24%	108.32%	113.95%	147.24%	104.89%	123.39%	132.08%	112.77%	141.41%	147.24%	81.88%	107.39%	112.99%	112.77%	141.41%	147.24%
EVOC 13 MEX	377	687	95.55%	102.51%	109.09%	113.37%	154.30%	170.67%	113.37%	137.94%	150.45%	98.04%	115.16%	127.07%	113.37%	154.30%	170.67%	85.85%	114.39%	121.47%	113.37%	154.30%	170.67%
EVOC 14 VEN	181	346	81.41%	84.18%	93.73%	85.79%	93.28%	106.52%	87.90%	118.85%	130.45%	99.24%	119.17%	123.18%				95.34%	117.41%	125.12%	158.14%	198.47%	213.84%
EVOC 15 RLA	693	1434	114.95%	123.23%	130.88%	115.52%	144.08%	147.82%	107.99%	141.10%	148.31%	122.78%	147.33%	150.13%				108.09%	139.92%	147.98%	140.72%	179.34%	187.13%
EVOC 16 EGY	115	254	208.08%	217.42%	220.63%	189.55%	236.67%	257.19%	189.55%	236.67%	257.19%	194.02%	218.34%	235.32%				149.30%	189.66%	197.44%	189.55%	236.67%	257.19%
EVOC 17 ZAF	335	484	50.61%	51.10%	57.34%	75.27%	75.83%	76.56%	40.61%	64.08%	73.44%	65.37%	77.85%	86.11%	69.88%	96.15%	106.02%	60.74%	88.61%	89.33%	69.88%	96.15%	106.02%
EVOC 18 NGA	188	461	241.42%	249.07%	260.34%	197.32%	287.64%	313.58%	197.32%	287.64%	313.58%	220.71%	250.59%	268.37%				174.38%	239.91%	249.38%	197.32%	287.64%	313.58%
EVOC 19 RNA	196	426	158.17%	169.06%	170.63%	159.74%	199.68%	218.43%	154.82%	201.55%	223.36%	151.86%	175.20%	189.63%				142.13%	185.36%	193.99%	168.86%	217.93%	240.51%
EVOC 20 RAF	560	1089	265.81%	270.40%	278.28%	172.54%	220.41%	233.65%	170.21%	221.93%	235.86%	215.45%	233.33%	241.80%				124.91%	169.42%	172.64%	174.46%	226.92%	241.24%
EVOC 21 SAU	211	468	100.23%	108.20%	111.55%	114.09%	131.28%	136.59%	98.99%	127.80%	138.62%	132.53%	158.75%	174.26%	173.26%	209.24%	222.60%	135.91%	175.51%	184.93%	173.26%	209.24%	222.60%
EVOC 22 ARE	94	215	91.51%	99.00%	102.31%	100.66%	117.62%	121.53%	104.08%	134.50%	150.02%	117.34%	139.92%	153.80%				143.75%	183.82%	194.37%	184.30%	222.78%	241.69%
EVOC 23 RME	596	1311	131.54%	141.12%	144.74%	150.12%	171.72%	174.51%	125.98%	157.61%	170.31%	133.35%	157.14%	168.21%				134.26%	173.55%	182.89%	169.06%	204.92%	218.61%
EVOC 24 CHN	3504	6820	113.07%	122.07%	126.81%	103.57%	151.33%	172.13%	103.57%	151.33%	172.13%	97.10%	129.88%	141.10%	103.57%	151.33%	172.13%	78.52%	139.57%	148.78%	103.57%	151.33%	172.13%
EVOC 25 IND	1079	2318	245.36%	266.06%	267.26%	158.64%	235.28%	262.27%	158.64%	235.28%	262.27%	177.70%	240.95%	268.66%	158.64%	235.28%	262.27%	102.30%	195.97%	213.18%	158.64%	235.28%	262.27%
EVOC 26 IDN	279	694	233.25%	245.20%	251.77%	170.09%	239.00%	254.16%	170.09%	239.00%	254.16%	186.82%	233.41%	252.03%	170.09%	239.00%	254.16%	128.47%	203.45%	211.38%	170.09%	239.00%	254.16%
EVOC 27 KOR	300	729	113.79%	128.74%	133.17%	102.49%	124.86%	130.63%	88.49%	142.04%	169.29%	112.97%	169.73%	185.75%	159.34%	228.63%	262.93%	118.34%	199.45%	211.26%	159.34%	228.63%	262.93%
EVOC 28 MYS	65	155	150.75%	161.37%	170.86%	158.69%	223.24%	230.53%	158.69%	181.34%	189.01%	137.41%	182.84%	206.32%				122.62%	194.72%	199.80%	158.69%	223.24%	230.53%
EVOC 29 PHL	80	160	231.54%	240.42%	245.17%	121.66%	174.70%	186.91%	121.66%	174.70%	186.91%	172.21%	208.63%	222.98%				85.37%	145.08%	151.29%	121.66%	174.70%	186.91%
EVOC 30 SGP	30	73	110.34%	126.62%	135.52%	107.16%	131.87%	136.17%	97.95%	163.80%	180.99%	130.37%	199.29%	220.42%				121.17%	199.25%	206.15%	172.24%	257.62%	276.74%
EVOC 31 THA	170	405	154.21%	165.85%	171.51%	163.81%	227.26%	242.36%	163.81%	227.26%	242.36%	161.89%	217.95%	237.60%	163.81%	227.26%	242.36%	120.68%	191.29%	199.14%	163.81%	227.26%	242.36%
EVOC 32 RAA	757	1437	187.17%	196.33%	198.40%	99.87%	133.72%	143.06%	96.47%	132.92%	147.90%	131.41%	166.71%	181.89%				82.64%	143.02%	153.22%	112.30%	155.29%	171.79%
Figure 01 USA	6308	7706	9.54%	11.32%	15.01%	9.96%	10.28%	11.53%	11.62%	11.66%	11.73%	4.45%	7.18%	7.49%				12.27%	18.51%	19.91%	13.93%	23.76%	29.15%
Figure 02 EU25	5448	5727	-11.35%	-10.78%	-8.22%	-14.91%	-12.49%	-12.43%	-13.90%	-13.15%	-12.64%	-17.94%	-14.71%	-12.73%				-19.02%	-9.82%	-7.82%	1.98%	14.93%	21.75%
Figure 03 FRA	592	638	-0.88%	0.31%	3.57%	-3.01%	-1.11%	-0.34%	-3.78%	-3.73%	-3.70%	-9.41%	-5.77%	-4.38%				-11.29%	-3.46%	-2.76%	2.92%	14.80%	19.64%
Figure 04 GER	1253	1136	-24.33%	-23.34%	-20.81%	-26.76%	-25.35%	-24.81%	-24.70%	-24.65%	-24.63%	-28.85%	-26.99%	-26.32%				-29.92%	-23.74%	-23.18%	-14.76%	-3.45%	0.45%
Figure 05 UK	789	759	-16.15%	-15.06%	-12.27%	-18.68%	-17.11%	-16.49%	-16.91%	-16.86%	-16.83%	-23.02%	-21.18%	-20.31%				-22.82%	-16.01%	-15.40%	-9.24%	2.20%	6.73%
Figure 06 RUS+EEU	4284	2906	-36.64%	-33.83%	-32.78%	-39.88%	-35.65%	-34.17%	-38.64%	-35.55%	-32.69%	-40.49%	-33.23%	-26.87%				-35.11%	-21.02%	-13.41%	-32.72%	-19.20%	-10.06%
Figure 07 JPN	1313	1501	-7.03%	-5.96%	-2.84%	-10.16%	-8.09%	-7.90%	-9.60%	-9.52%	-9.50%	-13.87%	-11.51%	-10.31%				-21.53%	-17.02%	-15.95%	-2.81%	13.49%	17.53%
Figure 08 RAI	1236	1630	-8.83%	-7.44%	-4.40%	-9.82%	-9.00%	-7.81%	-7.66%	-7.60%	-7.56%	3.20%	10.53%	14.25%				-11.98%	-5.65%	-4.84%	21.65%	36.50%	41.13%
Figure 09 REEU	1175	1320	17.26%	22.38%	23.18%	16.82%	27.13%	31.68%	10.24%	23.23%	31.09%	16.90%	30.69%	41.13%				14.24%	33.71%	43.50%	23.28%	40.64%	52.29%
Figure 10 LAM	2151	4086	97.38%	103.61%	111.66%	107.86%	135.88%	139.66%	105.23%	123.24%	139.59%	105.69%	127.21%	129.82%				91.43%	118.99%	125.87%	125.89%	161.70%	169.93%
Figure 11 AFR	1393	2715	193.87%	196.01%	202.86%	152.41%	193.10%	206.24%	142.15%	191.21%	207.29%	170.71%	188.89%	200.04%				122.34%	163.42%	167.94%	152.86%	203.22%	219.71%
Figure 12 ME	902	1994	120.02%	129.01%	132.53%	136.51%	156.61%	159.84%	117.37%	148.21%	160.76%	131.49%	155.72%	168.13%				135.64%	175.08%	184.56%	171.63%	207.80%	221.90%
Figure 13 SAsia	1347	2838	257.17%	276.72%	277.79%	152.84%	224.40%	249.69%	152.84%	224.40%	249.69%	182.22%	242.52%	269.25%	152.84%	224.40%	249.69%	100.12%	190.42%	206.92%	152.84%	224.40%	249.69%
Figure 14 CPAsia	3692	7000	107.15%	115.93%	120.58%	97.84%	144.31%	164.30%	97.68%	143.60%	163.64%	90.47%	121.89%	132.62%	97.95%	144.53%	164.59%	74.57%	133.44%	142.48%	97.95%	144.53%	164.59%
Figure 15 EAsia	1225	2958	177.30%	188.96%	194.20%	141.80%	184.75%	192.10%	133.98%	188.54%	206.48%	156.88%	205.96%	223.60%				120.97%	195.12%	204.17%	162.19%	225.29%	245.81%
UNFCCC Annex I	18580	19497	-8.77%	-8.35%	-5.93%	-11.60%	-9.41%	-9.23%	-10.25%	-9.31%	-8.47%	-13.80%	-9.69%	-7.22%	-13.12%	-13.12%	-13.12%	-11.87%	-3.07%	-0.13%	-0.96%	11.98%	17.77%
UNFCCC Non Annex I	11355	21648	137.24%	141.18%	141.87%	120.85%	145.95%	165.09%	118.36%	142.43%	163.91%	122.07%	142.82%	158.32%	132.03%	158.98%	183.59%	92.92%	134.39%	149.48%	132.03%	158.98%	183.59%
World total	30342	41884	49.96%	50.00%	50.03%	40.92%	50.49%	58.67%	40.19%	49.87%	58.90%	40.18%	49.39%	57.74%	40.04%	50.12%	59.33%	29.52%	50.27%	58.63%	51.33%	67.02%	82.82%

Table 28. Results for the calculations on 650 ppmv CO_2eq. in 2050 from Section 3.2 (Figure 12)

650 ppmv CO_2eq.	Emissions in Mt CO_2eq.		C&C 2050 convergence Values as % of 1990			CDC Values as % of 1990			Multistage (per capita) Values as % of 1990			Triptych Values as % of 1990			Sectoral Values as % of 1990			Intensity Values as % of 1990			Reference Values as % of 1990		
Year	1990	2010	2050			2050			2050			2050			2050			2050			2050		
Country group			Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max
EVOC 01 USA	6308	7706	-73.11%	-67.92%	-67.92%	-74.47%	-71.84%	-69.63%	-100.00%	-68.71%	-66.25%	-57.16%	-49.97%	-49.24%				-40.90%	-28.16%	-21.10%	-14.98%	13.05%	38.00%
EVOC 02 EU15	4457	4848	-61.37%	-52.71%	-52.71%	-62.40%	-58.49%	-56.36%	-58.74%	-53.87%	-51.51%	-59.80%	-52.63%	-50.11%				-62.28%	-49.08%	-45.11%	-29.08%	2.96%	28.69%
EVOC 03 EU+10	991	879	-68.13%	-62.56%	-62.34%	-67.74%	-66.95%	-64.00%	-64.18%	-63.02%	-58.37%	-50.86%	-41.40%	-31.00%				-51.76%	-17.20%	-1.87%	-17.57%	14.37%	41.47%
EVOC 04 RWEU	117	130	-53.43%	-43.03%	-43.03%	-54.85%	-50.08%	-47.49%	-49.98%	-44.77%	-41.82%	-44.81%	-29.60%	-21.73%				-59.98%	-46.17%	-41.86%	-25.74%	7.13%	32.21%
EVOC 05 RUS	2839	2082	-75.83%	-72.77%	-72.77%	-77.11%	-76.10%	-69.53%	-74.56%	-73.44%	-66.15%	-71.48%	-60.82%	-54.27%				-44.16%	-5.06%	13.58%	-28.67%	5.36%	29.14%
EVOC 06 REEU in Annex I	1445	824	-69.66%	-66.28%	-66.28%	-71.27%	-70.40%	-64.36%	-68.07%	-67.11%	-60.40%	-66.04%	-53.36%	-44.58%				-61.30%	-33.71%	-20.80%	-43.36%	-16.56%	1.91%
EVOC 07 JPN	1313	1501	-58.30%	-48.34%	-48.34%	-59.05%	-54.65%	-52.90%	-54.50%	-49.61%	-47.66%	-56.47%	-49.26%	-46.16%				-66.06%	-59.30%	-55.02%	-36.48%	-11.35%	12.34%
EVOC 08 RAI	1119	1499	-73.10%	-68.56%	-68.56%	-74.36%	-72.40%	-69.62%	-86.61%	-68.93%	-68.25%	-55.11%	-46.49%	-45.49%				-54.76%	-41.94%	-36.97%	-2.97%	27.30%	53.51%
EVOC 10 REEU	993	871	-49.13%	-43.08%	-43.08%	-53.78%	-50.23%	-41.99%	-51.43%	-47.18%	-22.85%	-45.09%	-24.35%	-11.60%				-36.34%	9.02%	30.76%	-10.14%	32.67%	62.41%
EVOC 11 ARG	237	412	17.02%	17.02%	28.52%	2.73%	2.73%	45.18%	14.14%	14.14%	61.31%	32.33%	62.02%	78.85%				34.58%	98.00%	118.41%	137.75%	222.54%	295.64%
EVOC 12 BRZ	664	1205	91.87%	91.87%	110.73%	90.21%	100.70%	161.75%	87.16%	89.01%	199.10%	102.93%	142.57%	178.41%				39.61%	106.55%	127.00%	138.58%	222.99%	279.47%
EVOC 13 MEX	377	687	95.84%	95.84%	115.08%	92.11%	94.40%	170.57%	91.02%	91.02%	200.26%	81.04%	111.40%	123.92%				51.10%	129.01%	153.17%	140.62%	277.35%	385.57%
EVOC 14 VEN	181	346	-0.09%	-0.09%	9.72%	-12.29%	-12.29%	23.95%	-2.55%	1.40%	267.29%	53.86%	91.64%	101.96%				49.94%	116.58%	139.93%	203.06%	307.47%	420.06%
EVOC 15 RLA	693	1434	97.36%	97.36%	116.75%	60.05%	101.73%	142.67%	45.71%	79.38%	127.58%	101.78%	139.63%	190.70%				64.45%	147.22%	173.92%	158.28%	273.97%	350.57%
EVOC 16 EGY	115	254	449.00%	504.65%	568.79%	427.33%	677.59%	688.26%	348.23%	587.35%	710.06%	333.49%	440.79%	465.95%				149.85%	316.51%	357.33%	427.33%	734.55%	965.22%
EVOC 17 ZAF	335	484	32.18%	47.11%	63.16%	29.14%	29.14%	54.50%	43.49%	68.79%	268.79%	80.00%	106.25%	128.99%				54.88%	164.59%	178.69%	192.01%	324.18%	466.40%
EVOC 18 NGA	188	461	518.34%	588.15%	663.24%	678.04%	713.79%	741.28%	578.45%	723.83%	1035.97%	444.56%	481.82%	506.33%				206.22%	471.29%	516.20%	698.18%	929.44%	1319.97%
EVOC 19 RNA	196	426	255.53%	291.57%	333.11%	248.23%	314.19%	379.85%	252.18%	288.19%	479.07%	180.59%	261.44%	282.17%				142.67%	310.46%	352.03%	356.96%	589.03%	754.28%
EVOC 20 RAF	560	1089	783.94%	883.76%	991.15%	520.04%	651.69%	778.40%	528.47%	657.40%	806.66%	547.21%	599.85%	611.07%				152.00%	352.04%	380.88%	577.68%	860.65%	1161.26%
EVOC 21 SAU	211	468	-10.68%	2.58%	9.42%	-15.42%	-9.95%	23.61%	-6.02%	182.10%	450.87%	82.64%	174.91%	217.38%				108.02%	248.43%	285.22%	298.90%	513.71%	588.58%
EVOC 22 ARE	94	215	-74.29%	-70.47%	-68.50%	-75.65%	-74.08%	-64.42%	-69.66%	-66.11%	-60.47%	21.68%	103.08%	135.27%				114.94%	259.01%	297.98%	415.88%	606.15%	736.46%
EVOC 23 RME	596	1311	130.28%	164.46%	182.12%	105.74%	146.98%	206.46%	120.52%	174.01%	232.68%	120.55%	205.16%	227.65%				106.57%	245.97%	282.46%	311.97%	503.10%	580.07%
EVOC 24 CHN	3504	6820	90.18%	90.18%	131.01%	106.77%	111.89%	203.87%	99.88%	135.62%	170.19%	63.75%	107.94%	126.69%				18.03%	113.70%	143.23%	135.16%	242.83%	382.26%
EVOC 25 IND	1079	2318	598.80%	640.77%	640.77%	463.79%	653.70%	927.14%	463.79%	585.76%	925.75%	372.50%	487.68%	595.69%				77.22%	315.62%	388.27%	463.79%	653.70%	1106.77%
EVOC 26 IDN	279	694	418.69%	419.92%	439.38%	257.04%	378.71%	589.52%	257.04%	322.75%	486.10%	240.22%	295.53%	327.10%				78.21%	223.78%	258.14%	257.04%	378.71%	589.52%
EVOC 27 KOR	300	729	-17.58%	-17.58%	0.12%	-27.64%	-27.64%	13.10%	-19.60%	-12.54%	250.89%	36.97%	105.24%	158.91%				44.36%	167.08%	204.32%	232.44%	395.07%	612.29%
EVOC 28 MYS	65	155	134.15%	134.70%	143.49%	134.18%	139.60%	225.47%	128.94%	146.60%	339.69%	146.15%	209.67%	294.47%				73.64%	214.29%	244.82%	208.55%	340.42%	449.61%
EVOC 29 PHL	80	160	548.00%	549.54%	573.85%	237.27%	349.03%	538.32%	237.27%	349.03%	471.66%	303.10%	386.08%	422.89%				44.59%	161.54%	189.04%	237.27%	349.03%	538.32%
EVOC 30 SGP	30	73	-8.83%	-8.61%	-5.19%	-19.77%	-19.77%	7.10%	-10.86%	-9.18%	19.00%	110.25%	256.12%	363.09%				72.51%	219.14%	252.13%	375.25%	574.28%	928.94%
EVOC 31 THA	170	405	152.72%	153.32%	162.80%	161.05%	167.06%	251.48%	147.09%	186.38%	435.46%	193.77%	264.90%	334.56%				72.13%	210.85%	244.06%	295.52%	415.93%	668.66%
EVOC 32 RAA	757	1437	421.73%	430.84%	431.15%	158.45%	221.92%	331.55%	156.57%	214.35%	295.16%	230.26%	284.03%	327.22%				66.56%	181.88%	237.63%	211.21%	309.52%	486.60%
Figure 01 USA	6308	7706	-73.11%	-67.92%	-67.92%	-74.47%	-71.84%	-69.63%	-100.00%	-68.71%	-66.25%	-57.16%	-49.97%	-49.24%				-40.90%	-28.16%	-21.10%	-14.98%	13.05%	38.00%
Figure 02 EU25	5448	5727	-62.60%	-54.50%	-54.46%	-63.38%	-60.02%	-57.76%	-59.51%	-55.64%	-52.77%	-58.16%	-50.59%	-46.65%				-60.36%	-43.29%	-37.28%	-23.79%	5.03%	31.01%
Figure 03 FRA	592	638	-52.82%	-42.29%	-42.29%	-54.18%	-49.33%	-46.71%	-49.08%	-43.71%	-40.78%	-60.67%	-51.21%	-48.14%				-58.99%	-44.64%	-40.32%	-25.12%	7.08%	30.68%
Figure 04 GER	1253	1136	-70.21%	-63.55%	-63.55%	-71.06%	-68.00%	-66.34%	-67.85%	-64.45%	-62.60%	-63.00%	-57.37%	-55.38%				-67.60%	-56.27%	-52.85%	-43.04%	-16.59%	6.03%
Figure 05 UK	789	759	-65.71%	-58.05%	-58.05%	-66.69%	-63.17%	-61.26%	-62.99%	-59.08%	-56.96%	-64.95%	-59.17%	-57.28%				-64.32%	-51.84%	-48.08%	-38.05%	-10.11%	12.43%
Figure 06 RUS+EEU	4284	2906	-73.74%	-70.58%	-70.58%	-75.14%	-74.17%	-67.79%	-72.37%	-71.30%	-64.21%	-69.65%	-58.31%	-51.04%				-49.94%	-14.72%	1.99%	-33.62%	-2.03%	19.95%
Figure 07 JPN	1313	1501	-58.30%	-48.34%	-48.34%	-59.05%	-54.65%	-52.90%	-54.50%	-49.61%	-47.66%	-56.47%	-49.26%	-46.16%				-66.06%	-59.30%	-55.02%	-36.48%	-11.35%	12.34%
Figure 08 RAI	1236	1630	-71.24%	-66.13%	-66.13%	-72.51%	-70.28%	-67.52%	-82.36%	-66.64%	-66.01%	-54.13%	-44.88%	-43.24%				-55.26%	-42.34%	-37.43%	-4.06%	25.55%	51.49%
Figure 09 REEU	1175	1320	-4.42%	8.50%	10.81%	3.27%	15.00%	34.97%	-0.84%	7.15%	56.76%	0.32%	42.91%	62.55%				-2.25%	52.02%	76.10%	52.21%	114.52%	150.07%
Figure 10 LAM	2151	4086	78.37%	78.37%	95.90%	66.28%	82.01%	132.75%	62.01%	71.68%	166.86%	87.31%	123.88%	153.33%				49.94%	123.49%	146.84%	150.61%	261.00%	334.57%
Figure 11 AFR	1393	2715	486.30%	528.31%	575.82%	386.39%	472.61%	522.69%	376.66%	502.40%	573.59%	365.42%	398.18%	422.70%				144.45%	314.32%	344.45%	457.87%	688.73%	942.37%
Figure 12 ME	902	1994	75.88%	101.99%	115.48%	58.41%	87.12%	135.32%	71.00%	152.94%	245.50%	101.34%	184.27%	215.60%				107.78%	247.91%	284.72%	319.75%	516.34%	598.38%
Figure 13 SAsia	1347	2838	651.54%	696.68%	696.68%	441.29%	612.57%	887.20%	441.29%	550.65%	869.63%	391.01%	495.50%	597.28%				77.42%	308.82%	380.46%	441.29%	612.77%	1034.52%
Figure 14 CPAsia	3692	7000	84.05%	84.05%	123.57%	99.90%	104.86%	194.06%	93.41%	127.10%	162.89%	58.14%	100.99%	118.94%				20.03%	110.19%	141.01%	128.29%	233.49%	368.29%
Figure 15 EAsia	1225	2958	224.81%	224.81%	241.74%	124.91%	180.84%	242.63%	133.01%	197.46%	237.83%	175.48%	232.32%	286.12%				62.52%	195.04%	229.43%	247.58%	378.39%	580.56%
UNFCCC Annex I	18580	19497	-68.53%	-63.14%	-63.13%	-70.18%	-67.63%	-64.45%	-75.79%	-64.03%	-61.73%	-60.13%	-51.75%	-48.35%				-51.48%	-32.72%	-24.09%	-19.77%	8.71%	30.73%
UNFCCC Non Annex I	11355	21648	215.82%	215.82%	225.54%	165.97%	219.54%	245.30%	172.77%	221.90%	266.49%	154.27%	198.57%	227.93%				61.87%	165.96%	206.49%	250.86%	359.04%	526.85%
World total	30342	41884	44.96%	45.00%	45.03%	23.23%	45.17%	53.70%	27.69%	45.26%	63.12%	24.92%	46.57%	60.41%				-6.62%	45.17%	66.29%	85.81%	146.05%	223.70%

Table 29. Results for the Annex I sensitivity calculations on -20% reduction in 2020 compared to 1990 (~550 ppmv CO_2eq.) from Section 3.3 (Figure 15)

-20% in 2020 for EU27 (~550 ppmv CO2eq.) sensitivity analysis Year	Emissions in Mt CO_2eq. 1990	Equal % red. CO_2eq. Values as % of 1990 2020			Intensity Values as % of 1990 2020			Convergence CO_2eq./GDP Values as % of 1990 2020			Convergence CO_2eq./cap. Values as % of 1990 2020			Historical responsibility Values as % of 1990 2020			Triptych Values as % of 1990 2020			Sectoral Values as % of 1990 2020			Reference Values as % of 1990 2020		
Country group		Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max
Australia	435.08	-11.49%	-11.49%	-11.49%	-23.37%	-18.01%	-17.27%	-15.00%	-13.90%	-13.52%	-14.67%	-14.52%	-13.98%	-12.65%	-12.50%	-12.35%	-14.97%	-13.19%	-12.68%				24.93%	36.83%	39.56%
Austria	80.32	-28.70%	-28.70%	-28.70%	-36.95%	-31.39%	-30.89%	-26.72%	-23.54%	-22.70%	-26.75%	-25.97%	-25.52%	-31.58%	-31.45%	-31.30%	-28.89%	-26.65%	-25.69%				21.57%	36.86%	42.42%
Belarus	133.14	-52.12%	-50.29%	-48.36%	-52.02%	-41.77%	-36.77%	-52.75%	-50.06%	-47.19%	-50.01%	-47.30%	-46.38%	-52.38%	-50.35%	-48.21%	-51.56%	-46.70%	-42.01%				-38.97%	-28.98%	-21.12%
Belgium	162.27	-24.60%	-24.60%	-24.60%	-33.33%	-27.45%	-26.92%	-25.88%	-23.94%	-23.43%	-25.75%	-25.26%	-24.98%	-26.50%	-26.37%	-26.23%	-27.99%	-26.12%	-25.41%				13.10%	28.18%	33.98%
Bulgaria	116.34	-47.67%	-43.95%	-40.51%	-50.62%	-37.23%	-30.13%	-49.46%	-45.05%	-41.24%	-46.88%	-43.25%	-40.26%	-47.70%	-43.50%	-39.62%	-45.18%	-38.53%	-32.15%				-27.84%	-15.40%	-4.38%
Canada	619.30	-22.96%	-22.96%	-22.96%	-31.03%	-26.14%	-25.54%	-24.55%	-23.00%	-22.49%	-24.24%	-23.75%	-23.32%	-25.95%	-25.81%	-25.66%	-25.02%	-23.22%	-22.91%	-10.79%	7.63%	18.05%	22.14%	39.83%	49.14%
Croatia	31.29	-22.14%	-22.14%	-22.14%	-27.30%	-13.03%	-8.56%	-22.55%	-17.70%	-15.73%	-17.63%	-17.60%	-16.80%	-21.00%	-20.90%	-20.77%	-18.74%	-15.07%	-11.46%				18.69%	40.50%	60.10%
Czech Republic	197.23	-32.94%	-28.36%	-24.60%	-36.68%	-19.77%	-11.45%	-34.18%	-27.83%	-23.21%	-34.44%	-30.10%	-26.74%	-32.51%	-27.34%	-23.07%	-30.49%	-21.80%	-14.27%				-5.91%	11.03%	26.43%
Denmark	74.01	-35.25%	-35.25%	-35.25%	-42.75%	-37.70%	-37.25%	-34.95%	-32.69%	-32.09%	-34.88%	-34.31%	-33.99%	-39.24%	-39.11%	-38.98%	-36.38%	-35.06%	-34.50%				-0.18%	12.39%	17.15%
Estonia	42.64	-57.58%	-55.89%	-54.04%	-57.39%	-48.40%	-43.73%	-58.03%	-55.70%	-52.98%	-58.31%	-56.39%	-55.05%	-57.95%	-56.08%	-54.02%	-61.06%	-58.60%	-56.08%				-48.86%	-38.86%	-31.71%
Finland	73.56	-18.04%	-18.04%	-18.04%	-27.53%	-21.14%	-20.56%	-19.53%	-17.47%	-16.92%	-19.17%	-18.63%	-18.31%	-19.11%	-18.97%	-18.83%	-17.88%	-17.77%	-17.53%				15.37%	31.02%	35.91%
France	592.20	-18.04%	-18.04%	-18.04%	-27.53%	-21.14%	-20.56%	-17.57%	-14.67%	-13.91%	-16.70%	-15.89%	-15.43%	-18.44%	-18.32%	-18.18%	-20.72%	-17.89%	-16.67%				2.92%	14.80%	19.64%
Germany	1252.79	-35.25%	-35.25%	-35.25%	-42.75%	-37.70%	-37.25%	-36.01%	-34.20%	-33.73%	-35.41%	-34.90%	-34.61%	-36.59%	-36.49%	-36.37%	-37.37%	-35.90%	-35.27%				-14.76%	-3.45%	0.45%
Greece	120.21	2.45%	2.45%	2.45%	-9.41%	-1.42%	-0.70%	-0.82%	1.16%	1.68%	1.06%	1.75%	2.14%	3.15%	3.30%	3.46%	-3.01%	-1.16%	-0.35%				29.16%	45.37%	51.19%
Hungary	104.34	-28.26%	-25.16%	-22.96%	-32.30%	-16.27%	-9.52%	-27.82%	-21.10%	-17.22%	-27.04%	-23.97%	-22.13%	-27.58%	-24.13%	-21.66%	-27.69%	-21.82%	-16.79%				2.86%	18.25%	35.33%
Iceland	3.44	-9.85%	-9.85%	-9.85%	-20.28%	-13.25%	-12.62%	-10.42%	-7.70%	-6.99%	-10.80%	-10.17%	-9.81%	-9.87%	-9.74%	-9.60%	-7.99%	-4.37%	-2.57%				15.05%	27.97%	33.08%
Ireland	56.82	-7.39%	-7.39%	-7.39%	-18.11%	-10.89%	-10.24%	-8.21%	-5.52%	-4.81%	-9.59%	-9.07%	-8.77%	-8.24%	-8.09%	-7.93%	-10.46%	-8.45%	-7.88%				26.42%	40.41%	45.50%
Italy	533.66	-23.78%	-23.78%	-23.78%	-32.60%	-26.66%	-26.12%	-22.74%	-19.79%	-19.02%	-21.68%	-20.84%	-20.36%	-25.73%	-25.60%	-25.45%	-25.78%	-23.89%	-23.09%				16.02%	30.80%	36.00%
Japan	1313.02	-22.96%	-22.96%	-22.96%	-35.90%	-32.21%	-31.34%	-23.39%	-22.03%	-21.29%	-22.11%	-21.32%	-21.01%	-24.94%	-24.80%	-24.66%	-25.29%	-23.43%	-22.40%	-40.73%	-23.29%	-17.86%	-2.81%	13.49%	17.53%
Kazakhstan	273.52	-41.16%	-38.17%	-35.18%	-40.76%	-27.72%	-20.64%	-43.32%	-39.97%	-36.11%	-41.27%	-37.67%	-35.58%	-41.17%	-37.84%	-34.52%	-40.09%	-33.04%	-26.15%	-60.38%	-42.64%	-28.96%	-24.50%	-9.74%	0.91%
Latvia	27.84	-62.65%	-61.14%	-59.75%	-62.59%	-54.41%	-50.72%	-60.51%	-56.02%	-53.15%	-59.03%	-56.37%	-56.07%	-63.01%	-61.33%	-59.79%	-61.04%	-57.11%	-53.90%				-47.88%	-41.20%	-34.24%
Liechtenstein	0.23	-24.61%	-24.61%	-24.61%							-19.89%	-18.75%	-18.14%	-27.19%	-27.05%	-26.92%	-39.16%	-38.72%	-38.68%				23.25%	37.59%	45.80%
Lithuania	52.54	-66.00%	-64.28%	-62.74%	-65.74%	-58.27%	-54.38%	-64.01%	-60.00%	-56.94%	-63.39%	-60.77%	-60.08%	-66.72%	-64.80%	-63.10%	-64.76%	-59.73%	-55.25%				-55.69%	-47.86%	-41.65%
Luxembourg	12.98	-40.99%	-40.99%	-40.99%	-47.82%	-43.22%	-42.81%	-39.98%	-37.61%	-36.99%	-43.06%	-42.80%	-42.65%	-42.82%	-42.72%	-42.60%	-44.34%	-43.21%	-42.83%				4.26%	17.76%	24.51%
Monaco	0.11	-24.62%	-24.62%	-24.62%							-8.39%	-6.07%	-4.73%	-27.21%	-27.03%	-26.94%	-19.00%	-15.12%	-13.92%				9.46%	22.66%	30.87%
Netherlands	260.34	-22.96%	-22.96%	-22.96%	-31.88%	-25.87%	-25.33%	-24.39%	-22.46%	-21.95%	-24.34%	-23.86%	-23.59%	-24.75%	-24.62%	-24.48%	-27.18%	-25.86%	-25.32%				8.45%	22.13%	27.78%
New Zealand	65.07	-18.04%	-18.04%	-18.04%	-29.05%	-24.09%	-23.40%	-20.91%	-19.76%	-19.36%	-19.54%	-19.35%	-18.63%	-19.85%	-19.71%	-19.56%	-19.66%	-16.81%	-16.45%				20.63%	30.44%	32.34%
Norway	57.37	-17.22%	-17.22%	-17.22%	-26.81%	-20.35%	-19.77%	-16.61%	-13.62%	-12.84%	-17.85%	-17.25%	-16.90%	-17.66%	-17.54%	-17.40%	-13.26%	-9.51%	-7.58%				3.54%	17.00%	20.99%
Poland	565.50	-39.61%	-34.98%	-30.89%	-42.88%	-27.16%	-18.84%	-40.72%	-34.72%	-29.95%	-39.45%	-35.02%	-31.39%	-39.47%	-34.22%	-29.62%	-39.21%	-32.76%	-26.65%				-16.32%	-1.61%	11.53%
Portugal	63.20	4.09%	4.09%	4.09%	-7.96%	0.15%	0.88%	3.47%	6.63%	7.47%	7.79%	9.02%	9.73%	3.59%	3.75%	3.93%	2.64%	5.08%	6.10%				43.20%	60.92%	67.25%
Romania	233.68	-40.89%	-36.53%	-32.99%	-43.73%	-29.22%	-21.31%	-41.85%	-36.94%	-32.53%	-38.66%	-34.36%	-31.36%	-40.40%	-35.47%	-31.48%	-37.55%	-29.73%	-22.18%				-18.58%	-3.36%	7.71%
Russian Federation	2838.88	-42.84%	-39.90%	-37.18%	-42.22%	-29.88%	-23.09%	-44.27%	-40.87%	-37.01%	-43.35%	-39.97%	-38.04%	-43.17%	-39.90%	-36.87%	-45.22%	-39.44%	-34.31%	-56.50%	-39.29%	-27.27%	-27.95%	-13.27%	-3.51%
Slovakia	73.67	-37.07%	-32.61%	-28.41%	-40.65%	-24.54%	-15.93%	-37.89%	-31.40%	-26.28%	-36.75%	-32.42%	-28.75%	-36.57%	-31.53%	-26.79%	-33.62%	-23.77%	-14.63%				-11.20%	4.33%	18.64%
Slovenia	18.65	-24.60%	-24.60%	-24.60%	-29.59%	-15.78%	-11.45%	-23.16%	-16.87%	-14.32%	-22.88%	-22.86%	-22.29%	-26.33%	-26.20%	-26.05%	-22.01%	-18.78%	-15.59%				40.33%	62.53%	85.55%
Spain	309.03	-5.75%	-5.75%	-5.75%	-16.66%	-9.31%	-8.65%	-5.15%	-1.79%	-0.91%	-3.46%	-2.46%	-1.88%	-7.63%	-7.47%	-7.29%	-7.40%	-5.10%	-4.17%				55.50%	75.28%	82.26%
Sweden	76.42	-14.76%	-14.76%	-14.76%	-24.63%	-17.98%	-17.39%	-13.43%	-10.06%	-9.17%	-12.78%	-11.88%	-11.36%	-14.93%	-14.80%	-14.66%	-11.93%	-6.84%	-4.17%				5.55%	18.73%	23.81%
Switzerland	56.21	-24.60%	-24.60%	-24.60%	-33.33%	-27.45%	-26.92%	-20.52%	-16.31%	-15.20%	-20.97%	-19.98%	-19.41%	-25.96%	-25.83%	-25.70%	-15.10%	-8.21%	-4.42%				5.13%	17.35%	23.86%
Turkey	182.98	68.07%	73.88%	75.54%	86.94%	114.58%	120.44%	74.82%	91.85%	97.95%	109.24%	118.58%	140.45%	76.01%	82.50%	84.21%	102.91%	123.24%	131.89%				165.19%	198.42%	207.41%
Ukraine	930.46	-61.99%	-60.51%	-58.86%	-61.85%	-53.79%	-49.63%	-62.88%	-61.07%	-58.77%	-60.79%	-58.81%	-57.88%	-63.75%	-62.13%	-60.29%	-60.61%	-55.16%	-50.18%				-52.27%	-42.32%	-36.00%
United Kingdom	788.83	-28.70%	-28.70%	-28.70%	-36.95%	-31.39%	-30.89%	-28.88%	-26.61%	-26.01%	-28.63%	-28.04%	-27.70%	-29.64%	-29.52%	-29.40%	-31.45%	-30.07%	-29.47%				-9.24%	2.20%	6.73%
United States of America	6308.45	0.81%	0.81%	0.81%	-8.29%	-3.19%	-2.05%	-1.87%	-0.54%	0.10%	-2.71%	-2.25%	-1.86%	2.05%	2.19%	2.35%	-4.20%	-1.93%	-1.62%	-31.59%	-20.34%	-13.23%	13.93%	23.76%	29.15%
EU15	4456.64	-24.61%	-24.61%	-24.61%	-33.34%	-27.46%	-26.93%	-24.82%	-22.44%	-21.81%	-24.14%	-23.48%	-23.10%	-25.89%	-25.77%	-25.63%	-26.92%	-25.13%	-24.35%	-27.23%	-13.26%	-7.38%	3.82%	16.97%	21.84%
EU27	5897.76	-28.24%	-27.22%	-26.35%	-35.53%	-27.49%	-25.21%	-28.55%	-25.40%	-23.83%	-27.75%	-26.09%	-25.49%	-28.96%	-27.91%	-27.03%	-29.69%	-26.74%	-24.55%				-0.16%	12.42%	19.29%

Table 30. Results for the Annex I sensitivity calculations on -30% reduction in 2020 compared to 1990 (~450 ppmv CO_2eq.) from Section 3.3 (Figure 15)

-30% in 2020 for EU27 (~450 ppmv CO2eq.) sensitivity analysis Year	Emissions in Mt CO_2eq. 1990	Equal % red. CO_2eq. Values as % of 1990 2020			Intensity Values as % of 1990 2020			Convergence CO_2eq./GDP Values as % of 1990 2020			Convergence CO_2eq./cap. Values as % of 1990 2020			Historical responsibility Values as % of 1990 2020			Triptych Values as % of 1990 2020			Sectoral Values as % of 1990 2020			Reference Values as % of 1990 2020		
Country group		Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max
Australia	435.08	-22.79%	-22.79%	-22.79%	-33.19%	-28.52%	-27.87%	-24.56%	-23.97%	-23.80%	-24.48%	-24.38%	-24.14%	-24.63%	-24.40%	-24.16%	-23.36%	-22.29%	-22.07%				24.93%	36.83%	39.56%
Austria	80.32	-37.80%	-37.80%	-37.80%	-45.03%	-40.18%	-39.75%	-35.85%	-34.11%	-33.76%	-36.16%	-35.75%	-35.56%	-42.37%	-42.16%	-41.93%	-37.94%	-36.81%	-36.33%				21.57%	36.86%	42.42%
Belarus	133.14	-58.23%	-56.63%	-54.95%	-58.17%	-49.23%	-44.87%	-58.67%	-56.84%	-54.60%	-56.64%	-54.66%	-53.41%	-58.65%	-56.74%	-54.71%	-57.78%	-54.42%	-50.96%				-38.97%	-28.98%	-21.12%
Belgium	162.27	-34.23%	-34.23%	-34.23%	-41.87%	-36.75%	-36.28%	-34.51%	-33.45%	-33.24%	-34.60%	-34.34%	-34.22%	-37.24%	-37.04%	-36.82%	-35.00%	-33.93%	-33.44%				13.10%	28.18%	33.98%
Bulgaria	116.34	-54.36%	-51.11%	-48.11%	-56.94%	-45.27%	-39.09%	-55.24%	-51.70%	-48.52%	-53.59%	-50.36%	-47.59%	-54.40%	-50.39%	-46.69%	-53.14%	-47.48%	-42.58%				-27.84%	-15.40%	-4.38%
Canada	619.30	-32.80%	-32.80%	-32.80%	-39.87%	-35.61%	-35.08%	-33.42%	-32.61%	-32.40%	-33.36%	-33.14%	-32.96%	-37.53%	-37.31%	-37.07%	-32.55%	-31.83%	-31.66%	-22.57%	-3.98%	6.74%	22.14%	39.83%	49.14%
Croatia	31.29	-32.08%	-32.08%	-32.08%	-36.62%	-24.18%	-20.28%	-32.02%	-29.27%	-28.24%	-28.76%	-28.60%	-28.26%	-30.28%	-30.11%	-29.91%	-30.17%	-27.44%	-25.20%				18.69%	40.50%	60.10%
Czech Republic	197.23	-41.50%	-37.51%	-34.23%	-44.80%	-30.05%	-22.80%	-41.84%	-37.09%	-33.38%	-42.16%	-38.29%	-35.21%	-40.82%	-35.89%	-31.81%	-39.82%	-32.51%	-26.64%				-5.91%	11.03%	26.43%
Denmark	74.01	-43.52%	-43.52%	-43.52%	-50.09%	-45.68%	-45.29%	-42.78%	-41.55%	-41.30%	-42.95%	-42.65%	-42.51%	-49.84%	-49.64%	-49.42%	-42.39%	-41.60%	-41.27%				-0.18%	12.39%	17.15%
Estonia	42.64	-63.00%	-61.52%	-59.91%	-62.85%	-55.01%	-50.94%	-63.30%	-61.72%	-59.58%	-63.27%	-61.73%	-60.35%	-63.59%	-61.82%	-59.87%	-65.08%	-63.19%	-61.19%				-48.86%	-38.86%	-31.71%
Finland	73.56	-28.51%	-28.51%	-28.51%	-36.82%	-31.24%	-30.74%	-28.88%	-27.75%	-27.52%	-28.77%	-28.77%	-28.77%	-30.19%	-29.98%	-29.75%	-28.06%	-28.00%	-27.93%				15.37%	31.02%	35.91%
France	592.20	-28.51%	-28.51%	-28.51%	-36.82%	-31.24%	-30.74%	-27.51%	-25.93%	-25.61%	-27.21%	-26.78%	-26.58%	-29.14%	-28.94%	-28.72%	-28.87%	-27.61%	-27.16%				2.92%	14.80%	19.64%
Germany	1252.79	-43.52%	-43.52%	-43.52%	-50.09%	-45.68%	-45.29%	-43.52%	-42.54%	-42.34%	-43.29%	-43.03%	-42.90%	-45.65%	-45.47%	-45.29%	-43.99%	-43.20%	-42.82%				-14.76%	-3.45%	0.45%
Greece	120.21	-10.63%	-10.63%	-10.63%	-21.02%	-14.06%	-13.43%	-12.08%	-11.00%	-10.78%	-11.02%	-10.66%	-10.49%	-9.52%	-9.28%	-9.02%	-12.55%	-11.46%	-10.93%				29.16%	45.37%	51.19%
Hungary	104.34	-37.42%	-34.71%	-32.80%	-40.97%	-27.00%	-21.12%	-36.66%	-32.14%	-29.36%	-36.28%	-33.56%	-31.80%	-36.35%	-33.08%	-30.74%	-35.20%	-30.35%	-26.52%				2.86%	18.25%	35.33%
Iceland	3.44	-21.36%	-21.36%	-21.36%	-30.50%	-24.37%	-23.82%	-21.03%	-19.54%	-19.25%	-21.53%	-21.20%	-21.04%	-21.40%	-21.19%	-20.96%	-20.82%	-19.51%	-19.05%				15.05%	27.97%	33.08%
Ireland	56.82	-19.21%	-19.21%	-19.21%	-28.60%	-22.31%	-21.74%	-19.04%	-17.57%	-17.27%	-20.19%	-19.92%	-19.79%	-20.56%	-20.32%	-20.07%	-17.56%	-16.16%	-15.80%				26.42%	40.41%	45.50%
Italy	533.66	-33.51%	-33.51%	-33.51%	-41.24%	-36.06%	-35.59%	-32.17%	-30.56%	-30.24%	-31.75%	-31.31%	-31.10%	-36.60%	-36.39%	-36.17%	-33.68%	-32.71%	-32.25%				16.02%	30.80%	36.00%
Japan	1313.02	-32.80%	-32.80%	-32.80%	-44.11%	-40.90%	-40.14%	-32.39%	-31.60%	-31.25%	-31.81%	-31.37%	-31.25%	-35.93%	-35.72%	-35.49%	-33.85%	-32.91%	-32.31%	-54.67%	-36.93%	-31.12%	-2.81%	13.49%	17.53%
Kazakhstan	273.52	-48.67%	-46.06%	-43.46%	-48.35%	-36.98%	-30.81%	-50.02%	-47.28%	-44.28%	-48.48%	-45.61%	-43.41%	-48.69%	-45.55%	-42.40%	-46.69%	-41.00%	-35.40%	-65.79%	-47.65%	-33.55%	-24.50%	-9.74%	0.91%
Latvia	27.84	-67.42%	-66.10%	-64.89%	-67.38%	-60.25%	-57.04%	-66.09%	-63.58%	-61.62%	-64.91%	-63.05%	-62.30%	-67.98%	-66.41%	-64.96%	-65.75%	-63.04%	-60.68%				-47.88%	-41.20%	-34.24%
Liechtenstein	0.23	-34.22%	-34.22%	-34.22%							-30.73%	-30.16%	-29.90%	-38.33%	-38.13%	-37.89%	-41.22%	-40.82%	-40.78%				23.25%	37.59%	45.80%
Lithuania	52.54	-70.34%	-68.84%	-67.50%	-70.13%	-63.62%	-60.23%	-69.10%	-66.80%	-64.64%	-68.49%	-66.57%	-65.58%	-71.48%	-69.66%	-68.06%	-69.85%	-66.73%	-63.87%				-55.69%	-47.86%	-41.65%
Luxembourg	12.98	-48.53%	-48.53%	-48.53%	-54.51%	-50.50%	-50.14%	-47.34%	-46.05%	-45.79%	-49.59%	-49.45%	-49.38%	-51.43%	-51.26%	-51.08%	-48.44%	-47.73%	-47.42%				4.26%	17.76%	24.51%
Monaco	0.11	-34.26%	-34.26%	-34.26%							-23.19%	-21.94%	-21.41%	-38.27%	-38.05%	-37.82%	-22.21%	-18.38%	-17.13%				9.46%	22.66%	30.87%
Netherlands	260.34	-32.80%	-32.80%	-32.80%	-40.61%	-35.37%	-34.90%	-33.17%	-32.11%	-31.90%	-33.31%	-33.06%	-32.94%	-35.63%	-35.43%	-35.21%	-32.93%	-32.17%	-31.82%				8.45%	22.13%	27.78%
New Zealand	65.07	-28.51%	-28.51%	-28.51%	-38.14%	-33.82%	-33.21%	-29.88%	-29.26%	-29.09%	-29.14%	-29.01%	-28.70%	-31.37%	-31.15%	-30.91%	-27.04%	-25.11%	-25.02%				20.63%	30.44%	32.34%
Norway	57.37	-27.79%	-27.79%	-27.79%	-36.18%	-30.56%	-30.05%	-26.69%	-25.07%	-24.74%	-27.79%	-27.47%	-27.32%	-28.48%	-28.30%	-28.07%	-27.37%	-26.24%	-25.75%				3.54%	17.00%	20.99%
Poland	565.50	-47.32%	-43.28%	-39.71%	-50.20%	-36.49%	-29.24%	-47.62%	-43.03%	-39.13%	-46.92%	-42.99%	-39.64%	-47.10%	-42.07%	-37.69%	-46.55%	-41.11%	-36.27%				-16.32%	-1.61%	11.53%
Portugal	63.20	-9.20%	-9.20%	-9.20%	-19.76%	-12.68%	-12.04%	-8.79%	-7.06%	-6.71%	-6.25%	-5.60%	-5.29%	-9.99%	-9.73%	-9.45%	-8.18%	-6.78%	-6.19%				43.20%	60.92%	67.25%
Romania	233.68	-48.43%	-44.64%	-41.55%	-50.94%	-38.29%	-31.39%	-48.93%	-44.87%	-41.25%	-46.70%	-42.88%	-40.07%	-47.66%	-42.96%	-39.15%	-46.67%	-40.38%	-34.68%				-18.58%	-3.36%	7.71%
Russian Federation	2838.88	-50.14%	-47.57%	-45.20%	-49.62%	-38.87%	-32.94%	-51.05%	-48.34%	-45.43%	-50.19%	-47.47%	-45.46%	-50.66%	-47.57%	-44.72%	-51.30%	-47.38%	-43.81%	-60.47%	-42.99%	-30.70%	-27.95%	-13.27%	-3.51%
Slovakia	73.67	-45.10%	-41.21%	-37.55%	-48.25%	-34.21%	-26.70%	-45.22%	-40.39%	-36.26%	-44.59%	-40.74%	-37.36%	-44.32%	-39.51%	-34.98%	-43.80%	-35.63%	-28.66%				-11.20%	4.33%	18.64%
Slovenia	18.65	-34.23%	-34.23%	-34.23%	-38.62%	-26.57%	-22.80%	-32.98%	-29.42%	-28.09%	-32.75%	-32.63%	-32.38%	-36.97%	-36.76%	-36.53%	-31.68%	-28.93%	-27.05%				40.33%	62.53%	85.55%
Spain	309.03	-17.78%	-17.78%	-17.78%	-27.34%	-20.93%	-20.35%	-16.60%	-14.77%	-14.40%	-15.81%	-15.28%	-15.03%	-20.76%	-20.51%	-20.23%	-17.58%	-16.17%	-15.57%				55.50%	75.28%	82.26%
Sweden	76.42	-25.65%	-25.65%	-25.65%	-34.29%	-28.49%	-27.97%	-24.03%	-22.19%	-21.82%	-23.91%	-23.44%	-23.21%	-25.90%	-25.70%	-25.48%	-27.22%	-25.96%	-25.45%				5.55%	18.73%	23.81%
Switzerland	56.21	-34.23%	-34.23%	-34.23%	-41.87%	-36.75%	-36.28%	-30.78%	-28.48%	-28.02%	-31.46%	-30.94%	-30.69%	-36.38%	-36.18%	-35.97%	-33.76%	-32.99%	-32.71%				5.13%	17.35%	23.86%
Turkey	182.98	46.61%	51.68%	53.13%	62.98%	87.08%	92.19%	50.22%	59.03%	62.99%	71.00%	78.16%	86.83%	59.20%	65.34%	66.87%	65.68%	81.26%	85.77%				165.19%	198.42%	207.41%
Ukraine	930.46	-66.84%	-65.55%	-64.11%	-66.74%	-59.71%	-56.08%	-67.38%	-66.07%	-64.27%	-65.86%	-64.40%	-63.28%	-69.64%	-68.12%	-66.38%	-65.99%	-61.93%	-58.07%				-52.27%	-42.32%	-36.00%
United Kingdom	788.83	-37.80%	-37.80%	-37.80%	-45.03%	-40.18%	-39.75%	-37.35%	-36.11%	-35.86%	-37.39%	-37.09%	-36.94%	-39.30%	-39.11%	-38.92%	-37.69%	-36.94%	-36.58%				-9.24%	2.20%	6.73%
United States of America	6308.45	-12.06%	-12.06%	-12.06%	-20.04%	-15.60%	-14.60%	-13.32%	-12.61%	-12.34%	-13.96%	-13.75%	-13.59%	-10.10%	-9.87%	-9.63%	-12.13%	-10.80%	-10.60%	-46.23%	-34.63%	-27.08%	13.93%	23.76%	29.15%
EU15	4456.64	-34.24%	-34.24%	-34.24%	-41.88%	-36.76%	-36.30%	-33.78%	-32.47%	-32.21%	-33.55%	-33.20%	-33.04%	-36.26%	-36.07%	-35.85%	-34.46%	-33.52%	-33.10%	-38.27%	-24.10%	-17.96%	3.82%	16.97%	21.84%
EU27	5897.76	-37.36%	-36.46%	-35.70%	-43.74%	-36.74%	-34.75%	-36.99%	-35.02%	-33.94%	-36.68%	-35.46%	-34.83%	-38.50%	-37.56%	-36.78%	-37.33%	-35.34%	-33.76%	0.00%	0.00%	0.00%	-0.16%	12.42%	19.29%

Table 31. Results for the country overviews on 550 ppmv CO_2eq. in 2020 from Section 4

550 ppmv CO_2eq.	Emissions in	C&C 2050 convergence			CDC			Multistage (per capita)			Triptych			Sectoral			Intensity			Reference		
country overview	Mt CO_2eq.	Values as % of 1990			Values as % of 1990			Values as % of 1990			Values as % of 1990			Values as % of 1990			Values as % of 1990			Values as % of 1990		
Year	1990	2020			2020			2020			2020			2020			2020			2020		
Country group		Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max
EVOC 01 USA	6308	-5.07%	-3.52%	-0.32%	2.04%	2.29%	3.34%	-18.86%	-18.69%	-18.46%	-2.57%	-0.29%	0.01%				-2.86%	2.54%	3.74%	13.93%	23.76%	29.15%
EVOC 05 RUS	2839	-41.83%	-39.14%	-38.18%	-44.74%	-40.44%	-38.67%	-45.52%	-43.07%	-41.11%	-43.35%	-36.87%	-31.39%				-38.80%	-25.74%	-18.54%	-27.95%	-13.27%	-3.51%
EVOC 07 JPN	1313	-19.43%	-18.50%	-15.80%	-24.91%	-23.37%	-23.33%	-21.54%	-21.25%	-21.13%	-23.99%	-22.11%	-21.09%				-32.11%	-28.20%	-27.28%	-2.81%	13.49%	17.53%
EVOC 12 BRZ	664	68.36%	72.98%	80.80%	59.57%	67.56%	77.64%	64.94%	88.65%	93.70%	74.51%	90.37%	97.77%	102.69%	132.27%	147.24%	57.37%	79.44%	84.28%	112.77%	141.41%	147.24%
EVOC 13 MEX	377	69.47%	75.51%	81.21%	60.17%	69.47%	77.43%	63.53%	98.51%	114.22%	70.31%	85.03%	95.10%	67.22%	110.46%	128.38%	60.80%	85.50%	91.62%	113.37%	154.30%	170.67%
EVOC 17 ZAF	335	30.53%	30.95%	36.36%	44.32%	44.65%	44.93%	17.18%	36.73%	44.54%	44.67%	55.11%	61.87%	-0.28%	34.24%	48.58%	39.07%	63.18%	63.81%	69.88%	96.15%	106.02%
EVOC 24 CHN	3504	84.66%	92.46%	96.57%	83.20%	90.00%	106.28%	100.40%	108.21%	147.22%	65.25%	94.82%	104.44%	39.64%	99.65%	125.57%	54.46%	107.28%	115.25%	103.57%	151.33%	172.13%
EVOC 27 KOR	300	85.29%	98.24%	102.08%	76.89%	99.26%	103.67%	54.60%	97.71%	119.61%	88.95%	138.03%	151.19%	110.91%	183.59%	221.69%	88.91%	159.09%	169.30%	159.34%	228.63%	262.93%
Figure 02 EU25	5448	-23.17%	-22.68%	-20.46%	-27.70%	-25.77%	-25.60%	-26.67%	-25.97%	-25.48%	-26.25%	-23.65%	-21.97%				-29.93%	-21.97%	-20.25%	1.98%	14.93%	21.75%

550 ppmv CO_2eq.	Emissions in	C&C 2050 convergence			CDC			Multistage (per capita)			Triptych			Sectoral			Intensity			Reference		
country overview	Mt CO_2eq.	Values as % of 1990			Values as % of 1990			Values as % of 1990			Values as % of 1990			Values as % of 1990			Values as % of 1990			Values as % of 1990		
Year	1990	2050			2050			2050			2050			2050			2050			2050		
Country group		Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max
EVOC 01 USA	6308	-83.31%	-80.09%	-80.09%	-85.25%	-83.73%	-82.45%	-91.49%	-90.58%	-89.88%	-73.55%	-69.28%	-68.80%				-63.51%	-55.65%	-51.29%	-14.98%	13.05%	38.00%
EVOC 05 RUS	2839	-84.99%	-83.10%	-83.10%	-86.77%	-86.19%	-82.40%	-92.37%	-91.74%	-89.84%	-82.89%	-76.21%	-71.89%				-65.52%	-41.38%	-29.87%	-28.67%	5.36%	29.14%
EVOC 07 JPN	1313	-74.12%	-67.93%	-67.93%	-76.34%	-73.80%	-72.79%	-86.35%	-84.86%	-84.30%	-73.51%	-69.13%	-67.20%				-79.04%	-74.87%	-72.23%	-36.48%	-11.35%	12.34%
EVOC 12 BRZ	664	19.09%	19.09%	30.80%	-2.68%	-2.68%	37.54%	-42.70%	14.68%	161.71%	18.89%	44.16%	61.92%				-13.80%	27.53%	40.15%	138.58%	222.99%	279.47%
EVOC 13 MEX	377	21.55%	21.55%	33.50%	-0.67%	-0.67%	40.38%	-42.69%	-34.91%	162.73%	11.47%	30.44%	40.01%				-6.71%	41.39%	56.31%	140.62%	277.35%	385.57%
EVOC 17 ZAF	335	-17.96%	-8.69%	1.27%	-25.39%	-25.39%	-10.73%	-56.95%	-56.75%	-48.50%	9.28%	26.86%	41.49%				-4.38%	63.36%	72.07%	192.01%	324.18%	466.40%
EVOC 24 CHN	3504	18.04%	18.04%	43.38%	8.23%	14.51%	97.49%	-38.47%	28.02%	154.30%	0.39%	28.72%	41.36%				-27.13%	31.94%	50.17%	135.16%	242.83%	382.26%
EVOC 27 KOR	300	-48.84%	-48.84%	-37.86%	-58.19%	-58.19%	-34.65%	-74.47%	-71.86%	-62.30%	-18.25%	25.19%	59.54%				-10.87%	64.89%	87.89%	232.44%	395.07%	612.29%
Figure 02 EU25	5448	-76.79%	-71.76%	-71.73%	-78.84%	-76.90%	-75.59%	-87.78%	-86.53%	-85.87%	-74.54%	-69.98%	-67.53%				-75.53%	-64.99%	-61.27%	-23.79%	5.03%	31.01%

APPENDIX E COMPARISON OF DIFFERENT EMISSION REDUCTION SCENARIOS

Figure 29 and Figure 30 below give an overview of the different emission reduction scenarios that are available in literature for 2020 and 2050. We included data from den Elzen and Meinshausen (2005), Höhne, Höhne, Phylipsen et al. (2005a), Höhne and Blok (2006) and the fourth assessment report of the IPCC (IPCC 2007a). The data from den Elzen and Meinshausen include the possibility of emissions overshooting the target stabilisation level. The horizontal marks indicate the reduction levels we chose for this report.

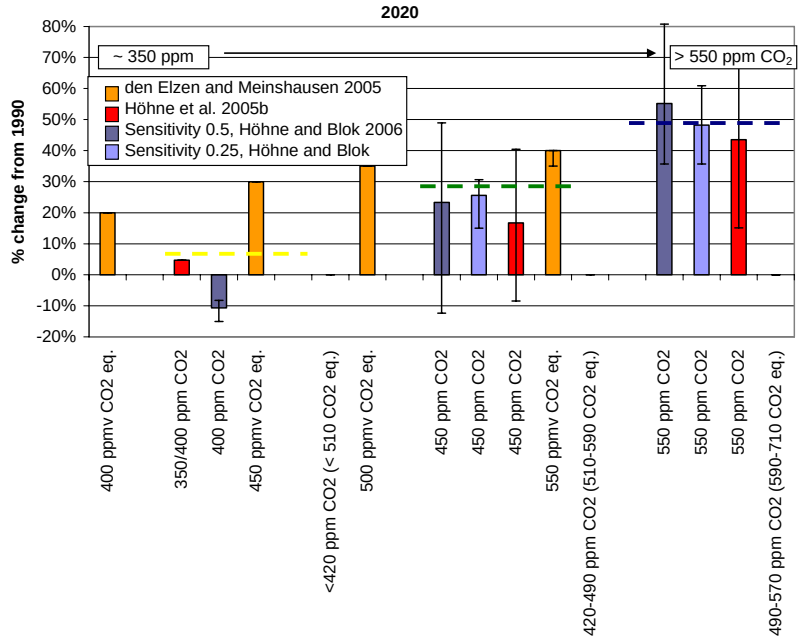


Figure 29. Comparison of different emission reduction scenarios for 2020 available in literature

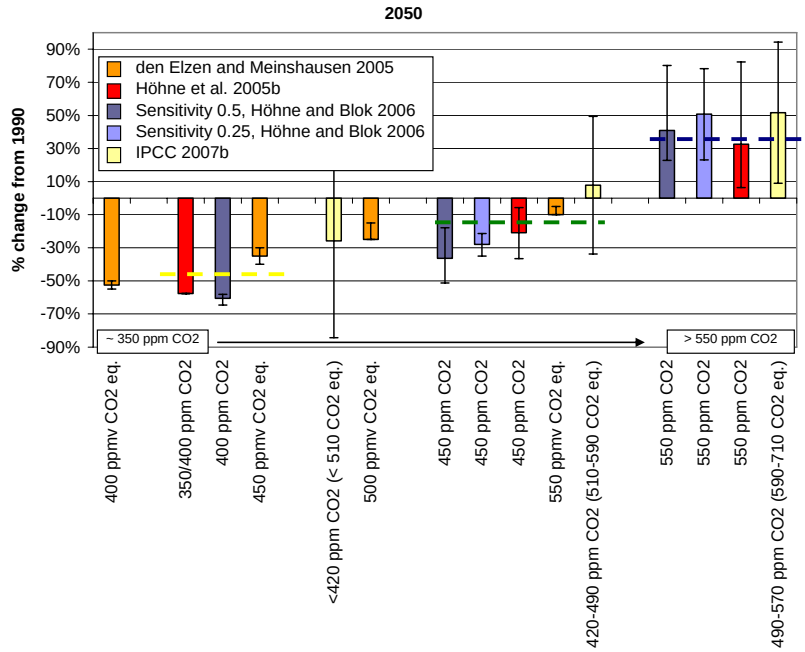


Figure 30. Comparison of different emission reduction scenarios for 2050 available in literature

UNITS AND ABBREVIATIONS

Table 32. Frequently used units

1000Ha	1000 hectare
1000Ha/yr	1000 hectare per year
Billion US$(2000)/yr	Billion (10^9) US Dollar (2000) per year
cal/cap/day	Calories per capita and year (1cal=4,1868 Joule)
CO_2eq.	Carbon dioxide equivalents
EJ	Exa joule (10^{18})
GWh	Giga watt hours (10^9 watt hours)
kg meat/cap/yr	Kilo grams of meat per capita and year
kgCO_2eq./kWh	Kilo grams of carbon dioxide equivalents per kilo watt hour
kgCO_2eq./US$	Kilo grams of carbon dioxide per unit of US Dollar
m^2	Square meter
million vehicle-km	Million kilometres driven per vehicle (per year)
Mt	Million tonnes
Mt/m^3	Million tonnes per square meter
MtCO2eq.	Million tonnes of carbon dioxide equivalents
Net per cap PIN	Net Production index number per capita
ppmv	Parts per million (10^6) by volume
tCO_2eq./cap	Tonnes of carbon dioxide equivalents per capita
toe/MUS$	Tonnes of oil equivalent per million (10^6) units of US Dollar

Table 33. Frequently used abbreviations

AP6	Asia Pacific Partnership
BAU	Business-as-usual (reference case)
C&C	Contraction and convergence
cap.	Capita
CDC	Common but differentiated convergence
CDM	Clean development mechanism
CHP	Combined heat and power (generation)
CO_2	Carbon dioxide
EIT	Economy in transition (Eastern European states and states of the former Soviet Union)
EVOC	Evolution of commitments tool
GDP	Gross domestic product
GHG	Greenhouse gas
IEA	International Energy Agency
JI	Joint implementation
LUCF	Land-use change and forestry
LULUCF	Land use, land-use change and forestry
MEX	Market exchange rates
PPP	Purchasing power parity
RE	Renewable energy
TPES	Total primary energy supply
UNFCCC	United Nations Framework Convention on Climate Change