Austria's

SEVENTH NATIONAL COMMUNICATION

in Compliance with the Obligations under the
United Nations Framework Convention on Climate Change,
according to Decisions 9/CP.16 and 4/CP.5
of the Conference of the Parties,
and in Compliance with the Obligations under the Kyoto Protocol,
according to Decisions 7/CMP.8 and 15/CMP.1
of the Conference of the Parties
serving as the meeting of the Parties to the Kyoto Protocol

The Seventh National Communication of Austria under the Framework Convention on Climate Change was drafted, co-ordinated and compiled by the Federal Ministry of Sustainability and Tourism (before 8 January 2018: Federal Ministry of Agriculture, Forestry, Environment and Water Management), Division I/4. Further contributions and amendments to the draft report have been provided by other units of Ministry, other ministries and the Federal Environment Agency.

Contents

Introductory Comments

National Communications under the UNFCCC follow specific reporting guidelines and particular COP decisions and present information how Parties fulfil requirements of the individual articles of the Convention. These requirements are supplemented by specific reporting requirements of the Kyoto Protocol. As it has turned out Austria's National Communications have been perceived mainly as a basis for the work of the Expert Review Team during the in-depth reviews. For this reason the text of Austria's National Communication has been streamlined in order to present facts and figures in a concise manner, preferring short statements and lists over elaborate text and elaborate design.

Reporting in the NC7 covers the years before 2018. In late 2017, on 18 December, the inauguration of a new government has taken place. Duties and designations of the Federal Ministries have partly changed with the amendment of the Ministerial Law on 8 January 2018 (see https://www.federal-chancellery.gv.at/ministries). **The present report shows the designations of the ministries as used up to the end of 2017.**

Chapter 1

Executive Summary

1.1 Introduction

The United Nations Framework Convention on Climate Change (UNFCCC) was signed by 158 countries, including Austria, within the scope of the UN Conference on Environment and Development (UNCED) held in Rio in June 1992. Austria, as the 58th country Party, ratified the UNFCCC on 27 February 1994.

Parties are obliged to prepare National Communications, in order to communicate their activities undertaken with a view to meeting commitments under the Convention. They shall report inter alia on the following: greenhouse gas inventory information; measures to mitigate greenhouse gas emissions; measures to counteract adverse effects of climate change; measures to promote research and systematic observation; financial support for developing countries; initiatives to enhance the transfer of technology between Parties; and measures to foster education and public awareness with respect to climate change.

This document is Austria's Seventh National Communication, by which Austria is complying with the obligation of communicating information to the Secretariat of the UNFCCC as specified under Art. 12 of the Convention.

This report serves to fulfil also the reporting obligations according to Art. 7.2 of the Kyoto Protocol, which has been signed by Austria April 1998 and ratified on 31 May 2002.

1.2 National Circumstances relevant to Greenhouse Gas Emissions and Removals

Austria is a land-locked country in central Europe with an area of 83,858 km^2. A large part of Austria is covered by the eastern Alps; about 40 % of the total area lies more than 1000 m above sea level. An increase of more than 1°C in average temperature has been observed during the last century. Forests make up almost half of the Austrian total territory; the agricultural area including alpine pastures has a share of more than one third. The Austrian political system is a Federation with 9 federal provinces (*Länder*), each of which has its own government and parliament. Government responsibilities are shared between federation, federal provinces and local authorities. Austria acceded to the European Union in 1995 and ceded some areas of national jurisdiction to the community.

Austria's total permanent population has reached 8.74 million inhabitants in 2016; after stagnation in the early 1980ies this represents an increase of more than one million since 1990. Slightly less than one third of all Austrians live in 5 cities with more than 100,000 inhabitants each; more than half of the population lives in communes with less than 10,000 inhabitants. Whereas population increased by 12 % from 1990 to 2015, the number of households increased by about 30 % and useful floor space by 43 %.

Gross domestic product (GDP) at current prices was € 353 billion in the year 2016 with a growth of 1.5 % in that year; per capita GDP was € 40,420. The largest contribution to Austria's GDP with more than two third comes from the tertiary production, the rest is contributed mainly by secondary production. The latter accounts for more than one third of Austria's GHG emissions, half of these emissions stem from iron and steel production. The Austrian energy profile shows a high share of renewable energy with more than one quarter of total gross energy consumption, contributed mainly by biomass and hydropower. With a gross domestic consumption per capita of 163 MJ in 2015 Austria belongs to the countries with low energy consumption among industrialised countries. Regarding the development of final energy consumption since 1990 the transport sector exhibits by far the strongest increase; however, the amount of road fuel that is sold in Austria but consumed abroad ("fuel export in the vehicle tank", the so called "fuel tourism") has been a significant reason for that increase. Regarding transport activity in Austria, public transport has a relevant share: About one quarter of all passenger kilometres in 2015 were travelled by public transport, rail and navigation had a share of slightly less than one third of freight transport.

1.3 Greenhouse Gas Inventory Information

The Seventh National Communication lists Austria's greenhouse gas emissions for the years 1990–2015 as reported in the annual inventory submission from April 2017 according to the IPCC 2006 Guidelines for National Greenhouse Gas Inventories. Summary tables according to the common reporting format are shown in Annex B of this report.

Austria's total emissions of the greenhouse gases CO_2, N_2O, CH_4, HFCs, PFCs, SF_6 and NF_3 (without emissions/removals from LULUCF) amounted to 78.9 Mt (million tons) CO_2 equivalent in the year 2015. The ranking of the CRF (sub)sectors according to their relative contribution is as follows:

1A3: Transport (29 %)
2: Industrial Processes and Product Use (21 %)
1A1: Energy Industries (14 %)
1A2: Manufacturing Industries and Construction (13 %)
1A4: Other Sectors (11 %)
3: Agriculture (9 %)
5: Waste (2 %)

The emissions of CO_2 clearly dominate the GHG emissions in Austria with 85 % compared to 8 % for CH_4, 4% for N_2O and 3 % for F-gases. CO_2 emissions per capita amounted to 7.7 t in 2015 and total greenhouse gas emissions per capita to 9.1 t CO_2 equivalent.

Total greenhouse gas emissions in 2015 were 0.05 Mt above the 1990 base year emissions. Emissions from transport increased considerably (+62%); emissions from waste, "other sectors" and agriculture showed a steady decline of (cf. Fig. 1.1). Emissions growth from road transport is due to increasing inland transport demand and increasing road fuel export in the vehicle tank.

Table 1.1: Austrian GHG emissions 1990 and 2007, in Mt CO_2 equivalent

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990					2015				
	CO_2	CH_4	N_2O	F-Gases	Total	CO_2	CH_4	N_2O	F-Gases	Total
Total without LULUCF	**62,29**	**10,51**	**4,34**	**1,66**	**78,80**	**66,72**	**6,57**	**3,52**	**2,03**	**78,85**
Total with LULUCF	**49,99**	**10,54**	**4,49**	**1,66**	**66,67**	**61,74**	**6,60**	**3,65**	**2,03**	**74,03**
1. Energy	**51,30**	**1,29**	**0,44**		**53,03**	**52,20**	**0,56**	**0,59**		**53,35**
A. Fuel Combustion	51,20	0,69	0,44		52,33	51,98	0,30	0,59		52,87
1. Energy Industries	13,79	0,01	0,04		13,84	10,80	0,03	0,11		10,93
2. Manuf, Industr., Constr.	9,81	0,01	0,07		9,89	10,31	0,02	0,13		10,47
3. Transport	13,78	0,07	0,13		13,98	22,38	0,01	0,20		22,59
4. Other Sectors	13,79	0,61	0,19		14,59	8,45	0,24	0,15		8,84
5. Other	0,04	0,00	0,00		0,04	0,05	0,00	0,00		0,05
B. Fugitive Emiss. from Fuels	0,10	0,60	IE,NA		0,70	0,21	0,26	IE,NA		0,48
2. IPPU	**10,87**	**0,04**	**1,10**	**1,66**	**13,66**	**14,41**	**0,05**	**0,18**	**2,03**	**16,68**
3. Agriculture	**0,09**	**5,41**	**2,69**		**8,19**	**0,11**	**4,57**	**2,49**		**7,17**
4. LULUCF	**-12,31**	**0,02**	**0,14**		**-12,14**	**-4,98**	**0,02**	**0,13**		**-4,82**
5. Waste	**0,03**	**3,78**	**0,12**		**3,93**	**0,00**	**1,40**	**0,26**		**1,66**
6. Other	**NO**	**NO**	**NO**		**NO**	**NO**	**NO**	**NO**		**NO**

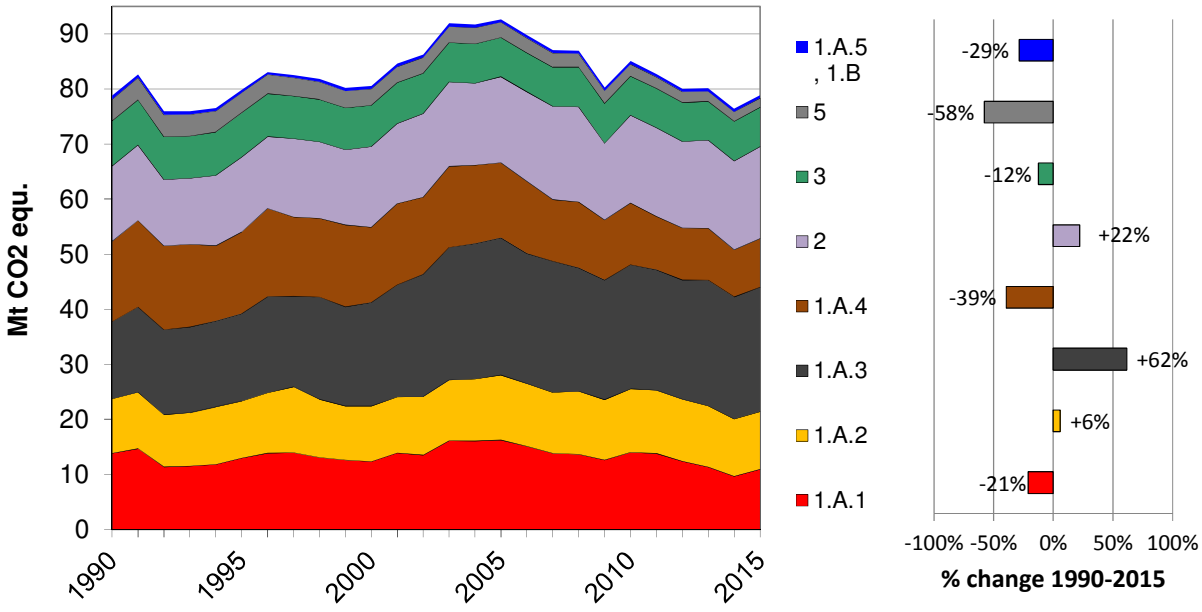

Figure 1.1: GHG emission trend by sector

1.4 Policies and Measures

The Ministry of Agriculture and Forestry, Environment and Water Management has a co-ordinating function with respect to the overall climate change policy in Austria. However, jurisdiction for policies and measures to mitigate greenhouse gas emissions is distributed among several federal ministries and other policy making and implementing entities, namely the federal provinces (*Länder*) and the municipalities. EU legislation has considerable impact on Austrian climate policy.

Targets and responsibilities to fulfil international and European climate change commitments are laid down in the Austrian Climate Change Act. For the implementation of individual policies and measures there are different legislative arrangements, depending on sectors and legislative and administrative competences. Based on the Climate Change Act, a national mitigation programme to meet the 2020 target under the EU Effort Sharing Decision has been adopted. Most *Länder* have adopted their own regional climate change programmes, taking into account specific regional circumstances and areas of competence.

Relevant policies cover energy industries and manufacturing industries (increase the share of renewable energy in power supply and district heating, Increase energy efficiency in energy and manufacturing industries), transport (Increase the share of clean energy sources in road transport, increase fuel efficiency of road transport, modal shift to environmentally friendly transport modes), the buildings sector (increase energy efficiency of buildings, increase the share of renewable energy for space heating, increase of energy efficiency in residential electricity demand), industrial process and product use (reduce emissions from F-gases and other product use), agriculture, waste and LULUCF.

1.5 Projections and the Total Effect of Policies and Measures

The latest national greenhouse gas (GHG) emission projections have been developed in the years 2016/2017. The "with measures" scenario (WM) is available and takes account of climate change mitigation measures that were implemented and adopted before June 2016. Modelling has been performed with a combination of an econometric top-down and several bottom-up models, in a co-operation of Umweltbundesamt with universities and other research-institutions.

The scenario shows a decrease of GHG emissions in the 'with measures' scenario from 78.9 Mt CO_2 equivalent in 2015 to 69.8 Mt in 2030 (-12%), which is mainly caused by decreasing emissions in from "other sectors", transport, IPPU und energy industries (see Table 1.2 and Figure 1.2). The share of CO_2, CH_4, N_2O and F-gases does not change significantly.

Table 1.2: Projected greenhouse gas emissions 2011–2030 in Mt CO_2 equivalen

	GHG emissions and removals						GHG emission projections			
	(kt CO_2 eq)						(kt CO_2 eq)			
	1990	1995	2000	2005	2010	2015	2020	2025	2030	2035
Sector										
1.A.1 Energy industries	13.838	12.965	12.314	16.240	13.988	10.928	8.943	8.335	8.081	7.597
1.A.2 Manufact. Industries	9.889	10.336	10.081	11.795	11.543	10.467	10.677	10.844	10.934	11.070
1.A.3 Transport	13.976	15.887	18.818	24.934	22.529	22.587	22.708	22.461	21.466	20.228
1.A.4 Other sectors	14.586	14.835	13.671	13.639	11.251	8.842	8.387	7.294	6.332	5.463
2. IPPU	13.663	13.606	14.642	15.612	15.926	16.676	15.512	14.947	14.308	14.267
3. Agriculture	8.189	8.038	7.506	7.104	7.094	7.168	7.342	7.347	7.357	7.538
4. LULUCF	-12.139	-13.405	-16.227	-10.733	-5.887	-4.824	-7.747	-8.101	-4.608	-4.905
5. Waste	3.925	3.651	2.963	2.791	2.158	1.656	1.312	1.083	930	833
1.A.5, 1.B	738	497	538	527	569	527	513	414	358	278
Total without LULUCF	78.805	79.815	80.534	92.642	85.059	78.851	75.393	72.724	69.767	67.274

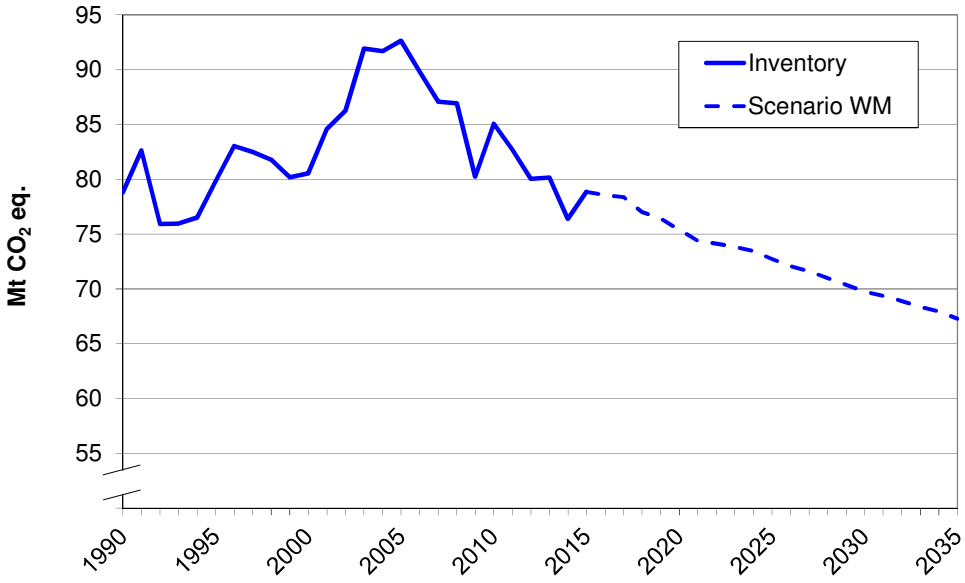

Figure 1.2: Projected greenhouse gas emissions in Austria

Drivers for the emission decrease are a. o. increased biomass use (energy industries, buildings) and use of other renewable energy sources (electricity generation), biofuels (transport), improved efficiency (buildings and heating systems, motor vehicles) and changes in production processes in industry.

1.6 Vulnerability Assessment, Climate Change Impacts and Adaptation Measures

Significant changes can already be observed. Mean annual temperature in Austria has increased by nearly 2°C since 1880. Glacier inventories show losses in area and volume and duration of snow cover has been reduced in the last decades. Changes of precipitation have been observed as well.

A detailed assessment of the aspects of climate change relevant for Austria has been compiled. The "Austrian Assessment Report Climate Change 2014", which has been developed according to the model of the IPCC Assessment Reports, deals with the physical science basis as well as with consequences for society and nature and with mitigation and adaptation.

Model results for Austria, based on the SRES A1B emissions scenario, show a. o. a medium temperature increase of almost 4°C for the end of the century (compared to the period 1961–90), a triplication of hot nights and heat waves and a comparable decrease of days with frost, as well as seasonal changes of precipitation. Vulnerability to climate change is different across sectors and regions; for example agriculture and forestry as well as ecosystems and biodiversity are assessed to be highly vulnerable to expected changes, whereas vulnerability of tourism is expected to be high for winter and lower for summer tourism. Vulnerability of water resources and water management exhibits strong regional

variability, vulnerability of transportation infrastructure is high in specific regions. Vulnerability concerning human health must be differentiated for population groups regarding heat stress, air quality and spreading of diseases.

A comprehensive national adaptation strategy has been developed, based on expert knowledge and an extensive stakeholder process. The strategy has been adopted by the Federal Government and by the *Länder* in 2012 and 2013 respectively; an update has been adopted by the Federal Government in August 2017. In total 136 recommendations in 14 areas have been included in the National Strategy for Adaptation. The Action Plan, as the second part of the Strategy, describes the recommendations in detail. The Action Plans lists a. o. the objective, relations to other instruments, status of implementation, further steps, necessary ressources and responsibilities for every recommendation. Implementation of the National Adaptation Strategy is done in close cooperation of Federation, *Länder* and local authorities. The *Länder* have prepared regional adaptation strategies or integrated adaptation issues in their climate mitigation strategies. Financial support is provided for model regions in implementing adaptation measures.

1.7 Financial Resources and Transfer of Technology

Public climate finance support by Austria to developing countries – including for technology transfer and capacity-building – has increased considerably since the UNFCCC entered into force. In the years 2013 to 2016, public bilateral and multilateral climate finance support has increased from EUR 142 million to 189 million. A broad range of actors and instruments contribute to Austria's overall contribution to climate finance.

A inter-ministerial working group regularly takes stock of developments related to climate finance, including the tracking of support. Its work is based on the Austrian climate finance strategy which has been adopted in 2013. The Austrian Development Agency collects the relevant data.

Austria is a pioneer nation in environmental technologies. Transfer of technology for mitigation and adaptation is a component of many of the programmes and projects supported by Austria's climate finance commitments; the Austrian Development Cooperation has a strong focus on sustainable energy, in particular hydro and solar power as well as dissemination of decentralised renewable energy solutions. Furthermore initiatives by Austrian enterprises in developing countries are supported, which are often related to renewable energy and energy efficient buildings. An important actor is the official Development Bank of Austria, mandated to promote sustainable development through financing private sector projects in developing countries; special focus is put on energy and resource efficiency as well as renewable energy.

Austria is also member of institutions and initiatives that focus on technology development and transfer, e.g. the Renewable Energy and Energy Efficiency Partnership, the Private Financing Advisory Network and the Global Forum on Sustainable Energy.

Capacity-building is an integral part of most of the projects which are supported by the Austrian Development Cooperation.

1.8 Research and Systematic Observation

Austria is actively engaged in promoting research and systematic observation related to the climate system by supporting numerous research projects and programmes, at both the national and the international level. Climate system research and research on climate change impacts are heavily influenced by the Alps, which cover almost two thirds of the surface area of Austria.

Research programmes on sustainable development have been set up by different ministries concerned. Projects related to climate change (impacts, adaptation, mitigation) are carried out by a large number of university institutes as well as by extra-university institutions like the Central Institute for Meteorology and Geodynamics, the Federal Environment Agency and research institutes of the Federal Ministry of Agriculture and Forestry, Environment and Water Management. The Climate and Energy Fund is an important actor, supporting RTD projects for the reduction of GHGs in Austria as well as basic climate system research. Since 2003 the programme "StartClim" supports research on climate change impacts and adaptation options, financed by the Federal Ministry of Agriculture, Forestry, Environment and Water Management together with partners. As a coordinating facility to promote and support climate research in Austria the Climate Change Centre Austria has been established in 2011.

A dense network of observing stations for meteorological and hydrological parameters has been brought about by the rather heterogeneous meteorological patterns in the alpine region. Austria's instrumental time series are amongst the longest in Europe and go back as far as the 18th century. The high altitude meteorological observatory at Hoher Sonnblick (at 3,106 metres above sea level) has been operating continuously since 1886, which is the longest continuous and homogeneous meteorological time series for high altitudes worldwide. Austrian data are exchanged within international networks such as the GCOS surface network (GSN), the GCOS upper air network (GUAN), the Global Atmosphere Watch (GAW), CLIMAT, the Global Terrestrial Network – Glaciers (GTN–G), the Network for the Detection of Atmospheric Composition Change (NDACC) and the World Data Centre for Greenhouse Gases (WDCGG). The Austrian GCOS coordination unit has been established at the Central Institute for Meteorology and Geodynamics and has compiled a comprehensive GCOS report in 2017.

1.9 Education, Training and Public Awareness

Environmental education in schools is an inter-disciplinary instruction principle and issues related to climate protection, such as energy saving and renewable energy, have received increased attention during the recent decades. A national *Strategy for Education for Sustainable Development* passed the Austrian Council of Ministers in 2008. Awareness of climate issues in schools is strengthened by various initiatives at Federation and *Länder* level. More than 500 schools participate in the Network for Schools and Environment (ÖKOLOG).

Training programmes and seminars have been established by public institutions and regional energy agencies for different target groups. Reliable and independent advisory services on energy issues are offered free of charge to private households by energy agencies and several non-profit environmental consulting organisations and partly by the *Länder* authorities themselves. Related programmes directed especially at small and medium enterprises exist in all *Länder*. The Federal Ministry of Agriculture and Forestry, Environment and Water Management has launched the initiative "klima*aktiv*" with a series of target-group oriented programmes in the areas construction and energy efficiency, transport and mobility, communities and renewable energy sources. Training and advisory services dealing with sustainable farming and forestry are offered by the regional Chambers of Agriculture and further institutions.

There is substantial public awareness on climate change issues in Austria. Campaigns and initiatives are organised and funded by the Federal Government and by the *Länder*; they usually focus on concrete recommendations and incentives for measures to protect the climate system, for example in the areas energy, transport and agriculture. Particular mention must be made of the Climate Alliance, which is a partnership between more than 1,700 European municipalities and the Indigenous Peoples of the rainforest in the Amazon Basin with the goal of protecting the earth's atmosphere. In Austria more than 960 municipalities and all *Länder* as well as a considerable number of companies and schools have joined the Climate Alliance. Climate Alliance Austria does not only contribute to public awareness of the global dimension of climate change, but has initiated many successful and impressive mitigation projects at community and company level.

Chapter 2

National Circumstances relevant to Greenhouse Gas Emissions and Removals

For emission indicators see also Appendix A.

2.1 Government structure

Austria is a federal state comprising nine federal provinces. Government responsibilities are shared by three levels of territorial authority, the federation ("Bund"), the nine federal provinces ("Länder") and the local authorities ("Gemeinden", municipalities).

The head of the Austrian state is the federal president („Bundespräsident"), who is directly elected by the people and represents the Republic of Austria internationally. He appoints the federal chancellor („Bundeskanzler"), who is the head of the Federal Government and, at the suggestion of the Bundeskanzler, the federal ministers. The "Nationalrat" and the "Bundesrat" are the two houses of Parliament, the main legislative body. The Nationalrat is elected every five years on the basis of an electoral system of proportional representation; the members of the Bundesrat are nominated by the parliaments of the provinces, the "Landtage".

Every federal province ("Land") has its own regional government ("Landesregierung") headed by the provincial governor ("Landeshauptmann"); the members of the Länder governments corresponding to the federal ministers are the "Landesräte".

A characteristic of Austria's political structure is the so-called "social partnership", the system of co-operation and co-ordination of interest between different interest groups, especially employers and employees. Several national federations are key players in the system, like the Federal Chamber of Labour, the Austrian Economic Chamber, the Austrian Chambers of Agriculture and the Austrian Trade Union Federation. The umbrella federations of the social partners also have influence as regards political opinion forming and decision-making.

Legislative and executive competences are distributed between the federation and the Länder according to the regulations on this matter in the Federal Constitution Act. Whenever a national approach is required but the federal government does not have the authority of policy making the parties involved may conclude a treaty of state ("Staatsvertrag") according to Art. 15a of the Federal Constitution Act in which they agree to undertake certain actions, jointly or separately.

Austria has become a Member State of the European Union in 1995. Part of the decisions and legislation in, a. o. the areas of climate change, energy, transport and agriculture, are made at EU level.

2.2 Population Profile

- Total permanent population: 8.74 million inhabitants in 2016.
- +1 million since 1990, due to immigration and increasing life expectancy (+14 %).
- Projection 2030: 31 % expected to be ≥60 years, only 30 % younger than 30 years.
- Life expectancy at birth: 70 years in 1970, 81 years in 2015.
- Future trends of Austrian population growth and age structure will be primarily determined by immigration policies.
- Increase of number of households more than two times higher than increase of population.
- Average household size is decreasing, +76% single-person households since 1990.
- Increase in population and number of households is an important driver for residential energy demand (see Section 2.10).
- Average population density: 102 inhabitants/km² total area or 263 inhabitants/km² settlement area.

Table 2.1: Austrian Population 1990 to 2016 and projection for 2030 by age groups (Data: Statistik Austria)

	1990	1995	2000	2005	2010	2016	2030
Total (Mio.)	7.68	7.95	8.01	8.23	8.36	8.74	9.43
< 15 years	18%	18%	17%	16%	15%	14%	15%
15-29 years	24%	21%	19%	19%	19%	18%	16%
30-44 years	21%	23%	25%	24%	22%	20%	20%
45-59 years	17%	18%	19%	19%	22%	23%	19%
60-74 years	13%	14%	14%	14%	15%	15%	19%
> 74 years	7%	6%	7%	8%	8%	9%	11%

Table 2.2: Private households and their size for selected years (Data: Statistik Austria)

	1990	1995	2000	2005	2010	2016
Total number of households (1000)	2,913	3,093	3,237	3,475	3,624	3,865
with 1 persons	814	893	977	1,198	1,300	1,429
with 2 persons	802	876	975	1,006	1,069	1,162
with 3-4 persons	989	1,038	1,025	1,015	1,012	1,034
with > 4 members	341	308	286	261	255	243
Average household size	2.6	2.5	2.4	2.3	2.3	2.2

2.3 Geographical Profile

Austria is located in southern central Europe, between 49°01' and 46°22' north and from 9°32' to 17°10' east, covering part of the eastern Alps and the Danube region. It is land-locked and has common borders with eight other countries. Due to its situation in the centre of Europe, Austria is quite exposed to activities of its neighbouring countries, e. g. to cross-border air pollution and to transit traffic, the latter having direct influence on emissions from transport.

Austria's total surface area covers 83,858 km^2 with a share of 37.5 % settlement area. The landscape falls into five main sections: The dominating Eastern Alps (63 % of total area), the Alpine and Carpathian foothills (11 %), the eastern foreland which is part of the low-lying Pannonic plains (11 %), the Vienna basin (4 %) and the Granite and Gneiss Highland north of the Danube which is part of the Bohemian massif (10 %).

About 70 % of Austria's surface is situated higher than 500 m above Sea level (maSl), 40 % higher than 1000 m; the landscape shows a very distinct orographic structure. Given the fact that ecosystems in mountainous regions are highly sensitive to changes, it is obvious that large parts of Austria are highly vulnerable to climatic changes.

2.4 Climate Profile

Austria belongs to the central European transitional climatic zone; climate is crucially influenced by the Alps, which are situated in a transitional area of the Mediterranean, the Atlantic Ocean and continental Europe. Austria can be divided into three climatic zones: The eastern part shows a continental Pannonian climate (mean temperature for July usually above 19°C, annual rainfall often less than 800 mm), while the central Alpine region has the characteristic features of the Alpine Climate (high precipitation, short summers, long winters). The remaining part of the country belongs to the transitional central European climatic zone, which is characterised by a wet and temperate climate (mean temperature for July 14–19°C, annual precipitation 700–2000 mm, depending on location, exposure and altitude). As Austria is a country with a highly structured relief, a lot of small-scale climatic processes occur caused by orographic conditions.

Mean daily temperature in Vienna (about 200 maSl) in January is 0.1°C (July: 20.2°C), the number of days per year with minimum temperature below 0°C is 66. In alpine regions temperatures can become considerably lower, e.g. in St. Jakob at 1,400 maSl mean daily temperature in January is -7.5°C (July: 13.2°C), the number of days per year with minimum temperature below 0°C is 197. Space heating is required in buildings throughout the winter season (partly from autumn to spring – depending on height above sea level and year-to-year variations in temperature). Winter temperatures are an important driver for residential energy consumption – about one fourth of final energy consumption in Austria is used for space heating (see also Section 2.10). The use of air conditioning in summer is increasing.

Since 1880 an increase of almost 2°C in average temperatures has been measured in Austria, a trend, which could be observed in all regions, whereas precipitation shows no homogeneous trend. In the western part, a rising tendency was observed during the 20th century; in the east and south precipitation has shown a falling tendency since the 1940ies. Exceptionally warm years could be observed during the last fifteen years, some of them years with the highest average temperature since the beginning of measurements in 1775. Since 2000, heating degree days above the long-term average have been measured only in three years (cf. Fig. 2.1). Useful indicators for long-term tendencies in average temperatures stem from measurements of the Alpine glaciers. Historical measurements reveal a steady decline of the volume of glaciers since the 19th century. This tendency has increased since the early 1980ies. (Source: Central Institute for Meteorology and Geodynamics, Institute of Meteorology of the University of Natural Resources and Applied Life Sciences, Vienna)

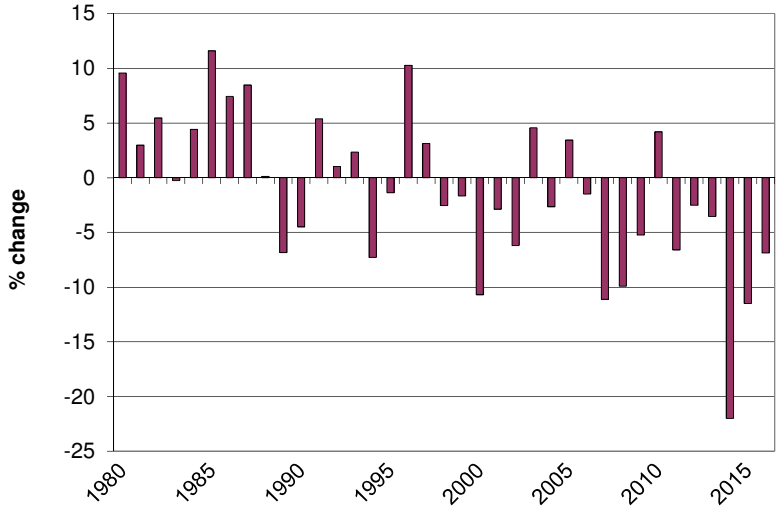

Fig. 2.1: Heating degree days in heating season (Jan–Apr and Oct–Dec), deviation from mean value for 1981–2010 (Data: Statistik Austria)

2.5 Economic Profile

- Austria has the characteristics of a small open economy; export and imports of goods are at a comparable level, the balance of trade in services shows high surplus.
- Export quota (goods and services): 52% in 2016 (34% in 1995).
- Largest share of exports – more than two third – is related to final goods.
- Austria's main trading partner is neighbour Germany (more than one third of total exports).
- GDP at current prices: € 353 billion in 2016.
- GDP per capita: € 40,420 (USD 44,176.5, rank in top 15 worldwide, Source Worldbank 2017).
- GHG emissions per GDP: 229 kg CO2 equ / 1000 € (2015, at current prices), in the lower range of EU and OECD countries
- Share of secondary sector in gross value added: 28% in 2016, continuously decreasing (see Table 2.4), share of the less energy (and emission) intensive tertiary sector increasing
- Tourism has significant share in gross value added: 5% in 2016, likely to be affected by climate change.

Table 2.3: Development of GDP in the period 1996-2016 (Source: Statistik Austria)

	GDP at current prices		**GDP/capita**	**GDP price index**		**GDP at 2010**
	bn €	% Change	€	Index	% Change	**prices** bn €
1996*	182.54		22,940	75.8		224.43
1997	188.72	+ 3.4	23,690	77.4	+ 2.1	229.13
1998	196.35	+ 4.0	24,610	80.2	+ 3.6	237.33
1999	203.85	+ 3.8	25,510	83.1	+ 3.6	245.77
2000	213.61	+ 4.8	26,660	85.9	+ 3.4	254.07
2001	220.53	+ 3.2	27,420	87.0	+ 1.3	257.29
2002	226.74	+ 2.8	28,050	88.4	+ 1.7	261.54
2003	231.86	+ 2.3	28,560	89.2	+ 0.9	264.00

2004	242.35	+ 4.5	29,670	91.7	+ 2.7	271.22
2005	254.08	+ 4.8	30,890	93.7	+ 2.2	277.31
2006	267.82	+ 5.4	32,390	97.0	+ 3.5	286.89
2007	283.98	+ 6.0	34,230	100.6	+ 3.7	297.58
2008	293.76	+ 3.4	35,300	102.0	+ 1.5	301.93
2009	288.04	- 1.9	34,530	98.2	- 3.8	290.56
2010	295.90	+ 2.7	35,390	**100.0**	+ 1.8	295.90
2011	310.13	+ 4.8	36,970	102.9	+ 2.9	304.55
2012	318.65	+ 2.7	37,820	103.6	+ 0.7	306.62
2013	323.91	+ 1.6	38,210	103.6	+ 0.0	306.70
2014	333.06	+ 2.8	38,980	104.5	+ 0.8	309.24
2015	344.49	+ 3.4	39,920	105.6	+ 1.1	312.61
2016	353.30	+ 2.6	40,420	107.2	+ 1.5	317.15

* The time series is based on the new "European System of National and Regional Accounts" (ESA 2010), which has been implemented in 2014. The ESA 2010 differs in scope as well as in concepts from its predecessor. Statistics Austria does not provide national accounts data according to ESA 2010 for the first half of the 1990ies and the time before.

Table 2.4: Gross value added and sector share (Source: Statistik Austria)

	1996	2006	2016
Gross value added (bn €)	163.2	239.1	314.7
Primary sector	2.2%	1.5%	1.2%
Secondary sector	32.2%	30.5%	27.7%
Tertiary sector	65.6%	68.0%	71.0%

2.6 Energy

Gross energy consumption:

- Rather high share of renewables in energy supply: 9 % hydro power[1] and 20 % other renewables (mainly biomass) in 2015.
- Still considerably dependency on fossil fuels: 36 % share of oil products, 20 % of natural gas and 10 % of coal products in 2015.
- Since 1990 decreasing share of coal, considerable increase of renewables and a decrease of oil products in the last decade.
- Total gross consumption increased by 37 % from 1990 to 2005, consumption of fossil coal, oil, gas by 34 %; from 2005 to 2015 total consumption decreased by 2 %, consumption of coal, oil and gas by 17 %.
- Around 60 % of gross energy consumption stem from imports.
- Gross energy consumption per capita: 163 GJ/cap in 2015, increase by 7% since 1996.
- Gross energy consumption per GDP (at 2010 prices): 4.5 €/MJ in 2015, decrease by 16 % since 1996.

Table 2.5: Gross energy consumption 1990–2015 in PJ (Data: Statistik Austria)

	1990	1995	2000	2005	2010	2015
Coal	172	145	153	168	142	136
Oil	444	478	513	611	549	508

[1] Without net imports/exports for electricity

Gas	219	270	276	339	340	288
Hydro	113	133	151	134	138	133
Other Renew.	98	113	127	163	248	278
Electricity	-2	-9	-5	9	9	36
Waste	8	9	11	16	29	30
Total	**1,052**	**1,140**	**1,224**	**1,439**	**1,454**	**1,409**

Final energy consumption:

- Share of oil products highest (38% in 2015, decrease after 2005, influenced by transport and export in the vehicle tank – see Section 2.7);
- share of electricity and gas (17 % in 2015) relatively constant (20 and 17 % respectively in 2015);
- increasing share of renewables and district heating since 2000 (15 and 7 % respectively in 2015);
- coal not relevant any longer;
- dominating sector is transport (35 % in 2015), followed by industry (29 %), households (23 %), service sector (11 %);
- share of household sector decreasing since 1990, transport stagnating at high level after increase until 2005;
- clear decoupling of GHG emissions from GDP and energy consumption (cf. Fig. 2.2).

Table 2.6: Final energy consumption by fuels 1990– 2015 in PJ (Data: Statistik Austria)

	1990	1995	2000	2005	2010	2015
Coal	51	38	33	25	20	18
Oil	328	365	402	496	434	413
Gas	114	145	167	193	198	182
Electricity	152	166	183	206	215	219
District heating	26	36	43	54	77	77
Renewables	89	93	103	119	160	168
Waste	4	5	6	9	13	11
Total	**764**	**847**	**937**	**1,102**	**1,117**	**1,087**

Table 2.7: Final energy consumption by sectors 1990–2015 in PJ (Data: Statistik Austria)

	1990	1995	2000	2005	2010	2015
Industry	214	221	249	296	319	314
Transport	209	245	293	379	369	378
Households	243	263	260	258	265	255
Services	73	96	113	145	141	117
Agriculture	24	22	22	23	22	23
Total	**764**	**847**	**937**	**1,102**	**1,117**	**1,087**

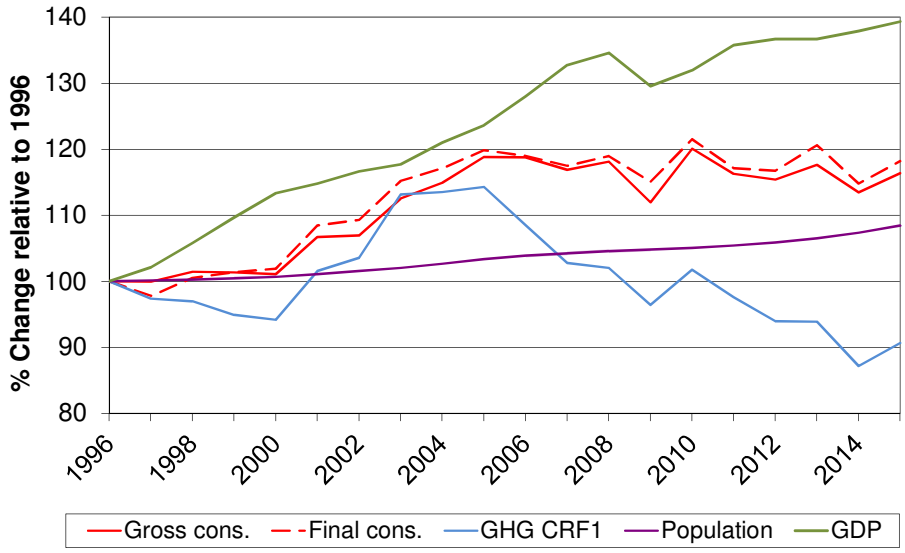

Fig. 2.2: Gross inland and final energy consumption, GHG emissions from fuel combustion, population und GDP at constant prices 2010; development relative to 1996 values
(Data: Statistik Austria, Umweltbundesamt)

Energy industries – public electricity and heat production

- accounts for about one fourth of gross inland consumption;
- accounts for 10 % of total GHG emissions and 15 % of emissions from fuel combustion;
- increasing demand is most important driver for emissions, would have increased emissions by about two third;
- increasing use of biomass and efficiency improvement (incl. cogeneration) as most important decreasing drivers have more than compensated the increase in demand;
- further drivers for emission increase are the increasing share of thermal plants in total electricity and heat production (due to the triplication of district heat demand) and the substitution of decreasing electricity production from industrial autoproducers by public plants;
- further drivers for emission decrease are growing electricity imports (from net exports in 1990 to 36 PJ imports in 2015) and shift from coal to gas (improved fossil carbon intensity);
- see also Fig. 2.3.

Table 2.8: Public electricity production from renewable sources 1990–2015

	1990	1995	2000	2005	2010	2015
Biofuels				3	8	8
Hydropower > 10 MW				115	118	113
Hydropower <= 10 MW				14	16	18
Windpower				5	7	17
Photovoltaics				0.1	0.3	3
Total	105	124	143	137	150	161

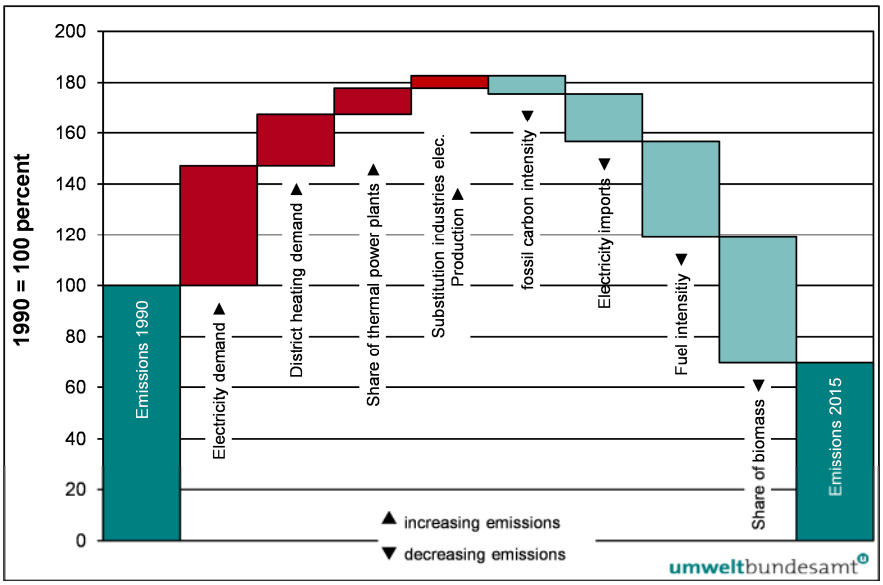

Figure 2.3: Decomposition analysis of sectoral GHG emissions – public electricity and heat production

Energy industries – petroleum refining

- one refinery in Austria, accounts for most of the rest of emissions from energy industries;
- amount of crude oil processed was slightly higher in 2015 than in 1990;
- change of product mix in favour of more energy intensive products, i.e. sulphur free fuels and light fraction products, has led to an emission increase of 17 %.

2.7 Transport

General

- Strong increase in transport volume after 1990, especially in freight transport: +59 % tonne-km 1990–2000, +39 % tonne-km 2000–2010 (whereas increase about 10 % 1980–1990).
- Reasons: A. o. fall of the iron curtain, Austria's accession to the European Union, introduction of the common currency, accession of eastern European countries to the Union.
- Registered vehicles: Passenger cars 4.7 million in 2015 (2.8 million in 1990), light duty vehicles 0.4 million in 2015 (0.2 million in 1990), heavy duty vehicles 0.08 million in 2015 (figure comparable to 1990, but an increasing share of Austrian road hauliers' vehicles has been registered in other countries in the meantime, i.e. "flagged out").
- Increased share of diesel fuelled passenger cars, from one tenth at the end of the 1980ies to almost 60 % in 2015;
- Number of electric cars (battery EV and plug-in hybrid V) increased from some 100 in 2010 to more than 18 000 in 2017 (0.4% of registered passenger cars); in 2017 new registrations of electric cars amounted to 2 % of all new registrations of cars.

Passenger transport

- inland passenger transport volume increased from 81 billion passenger-kilometres in 1990 to 113 billion in 2015;

- passenger transport dominated by cars (about two thirds of transport demand in 2015), about one quarter share of public transport;
- no significant change of modal split in the last decades;
- no relevant share of aviation in inland travel.

Table 2.9: Inland passenger transport 1990– 2015 (Source: Umweltbundesamt)

	1990	1995	2000	2005	2010	2015
Bio. passenger km						
Passenger cars	55.7	62.2	66.7	70.6	73.5	78.3
Motorcycles	0.8	0.9	1.2	1.3	1.6	1.9
Public transport	21.3	24.2	24.2	25.2	27.6	29.7
Walking & cycling	3.1	3.1	3.1	3.1	3.1	3.1
Aviation	0.1	0.1	0.2	0.2	0.2	0.0
Modal split						
Passenger cars	69%	69%	70%	70%	69%	69%
Motorcycles	1%	1%	1%	1%	2%	2%
Public transport	26%	27%	25%	25%	26%	26%
Walking & cycling	4%	3%	3%	3%	3%	3%
Aviation	0%	0%	0%	0%	0%	0%

Freight transport

- inland freight transport volume increased from 35 billion tonne-kilometres in 1990 to 73 billion in 2015;
- dominated by road transport (more than two thirds in 2015);
- relatively high share of rail transport compared to other EU countries (28 % in 2015),
- shipping (on the Danube river) of marginal relevance;
- modal split has shifted to road transport in the early 1990ies, relatively stable since then.

Table 2.10: Inland freight transport[2] 1990–2015 (Source: Umweltbundesamt)

	1990	1995	2000	2005	2010	2015
Bio. ton km						
Road	22.3	29.9	38.4	45.1	47.3	51.0
Rail	11.3	12.3	15.3	17.3	18.2	20.3
Shipping	1.7	2.0	2.4	2.8	2.4	1.8
Aviation	0.1	0.2	0.3	0.4	0.3	0.0
Modal split						
Road	63%	67%	68%	69%	69%	70%
Rail	32%	28%	27%	26%	27%	28%
Shipping	5%	5%	4%	4%	3%	2%
Aviation	0%	0%	1%	1%	0%	0%

Fuel sold in Austria and used abroad

- GHG inventory shows a disproportionately high increase of CO2 emissions from road transport after the mid 1990ies (compared to the inland transport demand). Caused

[2] Net freight – without weight of lorries transported by rail (piggyback transport) and without weight of containers

by increasing share of the fuel sold in Austria and used abroad ("fuel export in the vehicle tank").

- Reasons: slightly lower fuel prices than in many neighbouring countries, transit traffic on important routes for long-distance freight traffic crossing Austria, increasing transport demand due to the integration of eastern neighbour states into the European economic area (transit as well as import/export traffic).
- In 2005 about one third of the greenhouse gas emissions from transport were caused by fuel export in the vehicle tank (mainly by freight transport).
- Reduction of fuel export in the vehicle tank after 2005, stabilisation after 2010 (see Figure 2.9).

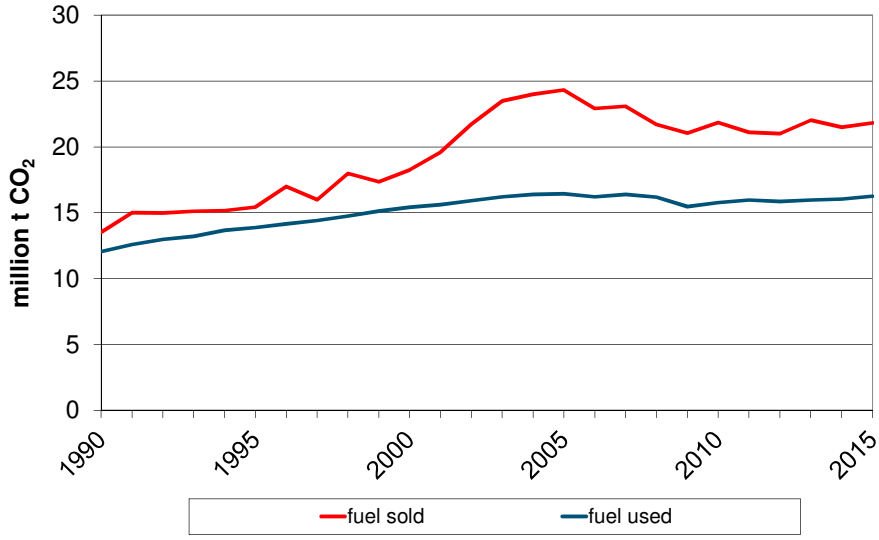

Fig 2.4: Carbon dioxide emissions of road transport – calculation based on fuel sales in Austria ("fuel sold") and on inland fuel use ("fuel used"). (Source: Umweltbundesamt)

Driving forces for emissions

- transport accounts for more than one third of final energy demand and for more than one fourth of GHG emissions (GHG emissions +60 % since 1990);
- increasing transport demand – and for freight transport also fuel export in the vehicle tank – are the most important drivers for the emission increase;
- further increasing factors are a shift of the modal split to road in freight transport and decreasing efficiency in passenger transport (i. e. decreasing passenger number per vehicle, trend to larger cars);
- the compulsory blending of diesel and petrol with biofuels has slowed down the emission increase;
- efficiency improvement in freight transport due to technical progress is a relevant driver;
- see Fig. 2.5.

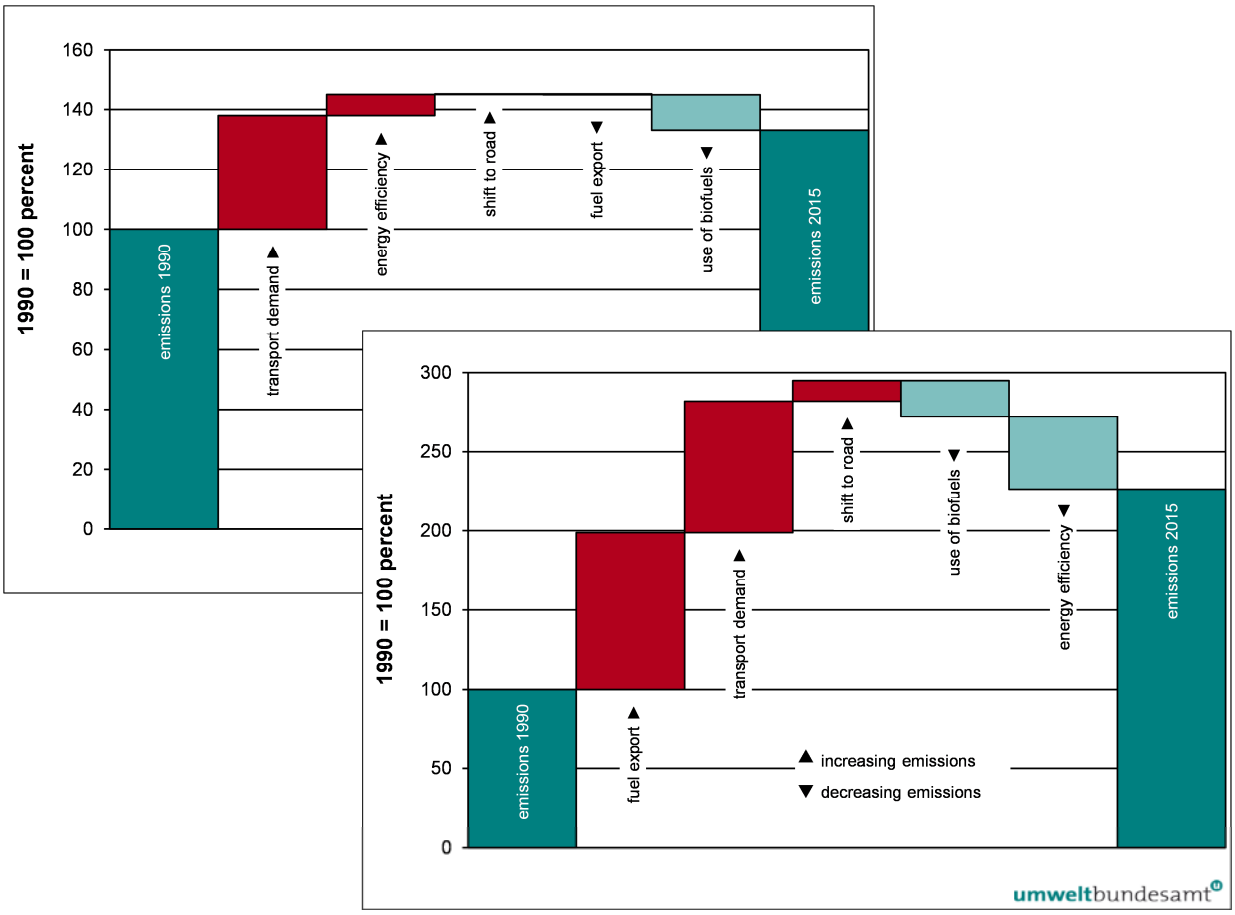

Figure 2.5: Decomposition analysis of sectoral GHG emissions – passenger transport (top) and freight transport (bottom)

2.8 Industry

General

- Gross value added of manufacturing industries (at 2010 prices) increased by about 60 % from 1996 to 2016, that of construction decreased by 11 %.
- GVA of manufacturing industries dropped by 15 % due to the economic depression in 2009, but reached pre-crisis level again in 2012; GVA of construction remains below the 2009 level.
- With regard to the growth of its industrial sector, Austria ranks among the leaders within the EU-15 countries.
- One fifth of Austria's economic productivity is derived directly from manufacturing industries, 6 % from construction. The most important branches of the production of goods are machines and steel construction, electrical and electronic appliances, chemicals, iron and metal products, food and vehicles.
- Compared to other industrialized countries basic materials industries still play a relevant role in Austria, industry's energy and process emissions account for more than one third of total emissions;
- iron and steel production accounts for about half of CO_2 emissions from manufacturing industries (energy and process), production of other metals, cement and lime, basic chemicals and pulp account for about a quarter;

- clear decoupling of emissions from iron and steel production from amount of steel produced, of emissions from other industry from gross value added (cf. Fig. 2.6).

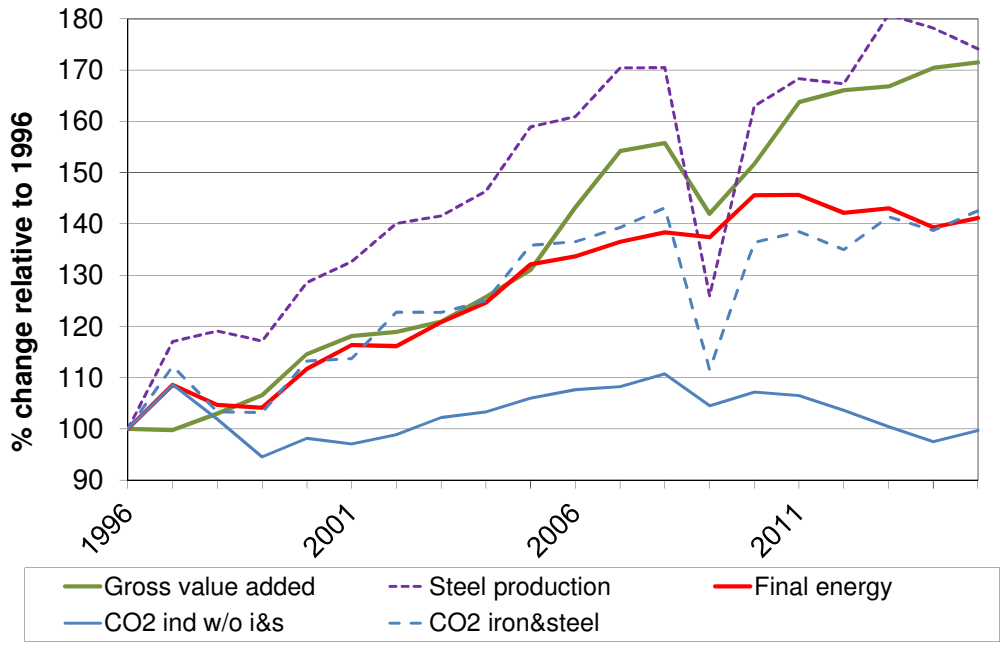

Fig. 2.6: Production of steel and CO_2 emissions; gross value added (at 2010 prices), final energy consumption and CO_2 emissions in the rest of manufacturing industries (Data: Statistik Austria, Umweltbundesamt)

Driving forces for emissions

- Early decoupling of energy consumption from production growth since the mid 1970ies – final energy consumption in manufacturing industries and construction relatively constant until the mid 1990ies, gross value added increased by about 50 ;
- driving force for emission increase (+40 %) of iron and steel industry was the 80 % increase of steel production (1990–2015);
- emission growth was mainly weakened by reduced energy intensity of raw iron and steel production (efficiency improvement of plants, increasing input of scrap iron);
- emission decrease in industry also as a consequence of a shift to fossil fuels with lower carbon content and the reduced share of fuels in total energy consumption (i.e. increasing share of electricity from the public grid);
- driving force for emissions increase in the rest of manufacturing industry was the increase in value added;
- decreasing factors are the higher biomass share, the reduced share of fuels in total energy consumption, shift to fossil fuels with lower carbon content and decreasing energy intensity of production (less energy demand per unit of value added).

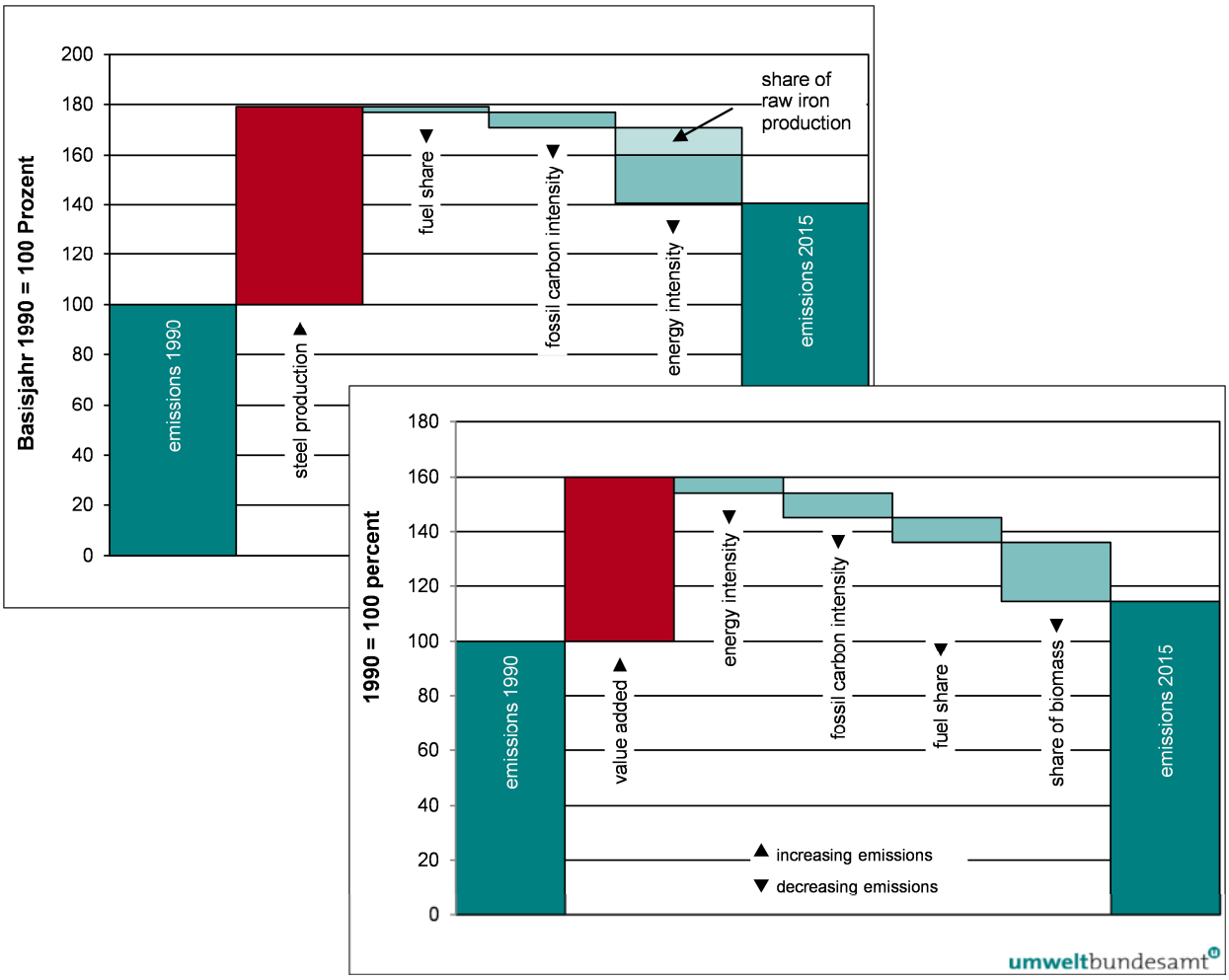

Figure 2.7 Decomposition analysis of sectoral GHG emissions – iron and steel production (top) and rest of manufacturing industries (bottom)

2.9 Waste

Solid waste

- Total amount of waste generated in Austria in 2015 was about 57 million tonnes; excavation material accounted for more than half of that amount, waste from construction for another 10 million tonnes.
- Disregarding excavation material, 65 % of total waste is recycled, 16 % is incinerated for energy recovery; 9 % is deposited to landfills, the rest undergoes other treatments.
- Waste from households and similar sources amounted to 4.2 million tonnes in 2015 (about 480 kg waste per capita); about one third was secondary material (glass, paper, metal, …) and about one fourth organic waste, which were collected separately.
- Incineration of household waste has become the most important treatment (cf. Table 2.11).
- There is practically no deposition of untreated household waste in landfills any longer due to law, no input of reactive carbon any longer, CH_4 emissions from landfills result from material deposited before 2005 and 2009 respectively.

- Treating of organic waste by composting and in biogas plants has increased since 1990, leading to some increase in emissions of CH_4 and N_2O from this subsector

Table 2.11: Treatment of household waste 1990–2015 (Source: Umweltbundesamt)

	1990	1995	2000	2005	2010	2015
Direct landfill	55%	32%	27%	6%	0%	0%
Mechan.-biolog. treatment	15%	7%	6%	10%	9%	7%
Incineration	12%	16%	15%	31%	40%	41%
Hazardous waste treatment	0.4%	0.8%	0.9%	1.4%	2.5%	2.1%
Recycling/recovery	16%	31%	35%	36%	31%	27%
Composting, fermentation	1%	13%	16%	16%	18%	22%

Wastewater

- Rate of connection to municipal sewage plants has increased from about 70 % of the population in 1990 to 95 % in 2014
- Strong decrease of CH_4 emissions from cesspits, increase of N_2O emissions from wastewater treatment plants

2.10 Building stock and urban structure

General

- 30 % of all Austrians live in Vienna and in the four cities with more than 100,000 inhabitants each;
- more than half of all Austrians live in communes with less than 10,000 inhabitants;
- rural communes partly with a quite low density of population and buildings, especially in the northern and south-eastern parts of Austria, leading to a high share of single family homes and unfavourable conditions for public transport;
- 44 % of the dwellings (with principal residences) are located in buildings with only one or two dwellings, about one third in buildings with 10 or more dwellings (latest survey 2011);
- high share of single-family houses with an inherently higher energy demand compared to multi-storey buildings;
- number of households and dwellings increased to a much higher extent than population did: Population +12 %, households and dwellings about +30 % (1990–2015);
- useful floor space has increased even faster (+43 %);
- most dwellings (>90 %) are equipped with central heating (including single storey heating and district heating), considerable improvement compared to 1990 (<60 %);
- one quarter of existing buildings is quite new (built after 1990), 15 % quite old (built before 1919), high share (about 40 %) of buildings from the period 1945 to 1980 when thermal efficiency was no priority;
- efficiency improvement measures for buildings and heating systems have lead to a clear decoupling of emissions from the growth of population and number of dwellings (cf. Fig. 2.8).

Table 2.12: Number of buildings and dwellings 1991 and 2011 (Source: Statistik Austria)

	1991	2011
Principal residences		
Total number of buildings (1000)	1,433	1,773
with 1-2 dwellings	1,257	1,523
with 3-10 dwellings	121	179
with >10 dwellings	55	71
Total number of dwellings (1000)	3,170	4,116
in buildings with 1-2 dwellings	1,483	1,806
in buildingswith 3-10 dwellings	662	976
in buildings with >10 dwellings	1,025	1,334
Secondary residences		
Total number of buildings (1000)	208	275
Total number of dwellings (1000)	223	325

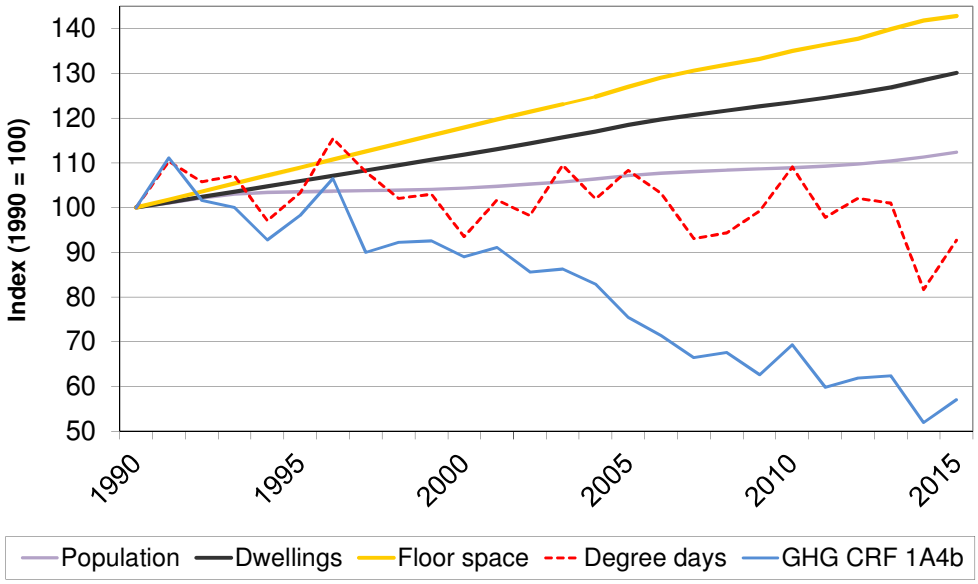

Fig. 2.8: Development of population, number of dwellings (main residences), floor space, heating degree days (Jan–Apr, Oct-Dec) and GHG emissions from households 1990–2015 (Data: Statistik Austria, Umweltbundesamt)

Driving forces for emissions

- Emissions from space heating in the household sector have decreased by more than one third; increase of dwellings and floor space would have led to an emission increase of more than 40 % (cf. Fig. 2.9);
- most important drivers for reduction are the increased efficiency of buildings and heating systems (i.e. lower final energy demand per m² due to renovation of existing buildings and better thermal standards of new buildings), increased share of biomass and district heating in the final energy demand for heating;
- further reductions of sector emissions due to lower fossil carbon intensity (i.e. shift to gas), increased use of ambient heat (solar thermal and heat pumps) and an increasing share of electricity in final energy demand.

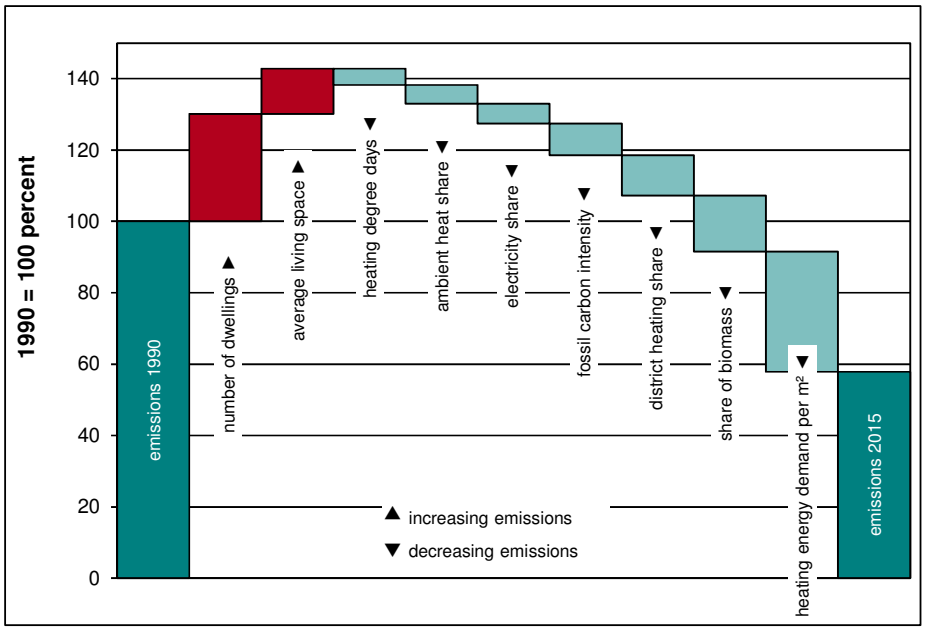

Figure 2.9: Decomposition analysis of sectoral GHG emissions from households

2.11 Agriculture and forestry

General

- Area used for agriculture has a share of about one third of the Austrian total territory while forests make up almost half of the territory;
- Forestry and extensive grassland production with cattle stocking dominate in the Alpine regions, while arable farming is concentrated on the lowlands and basins and especially in the east of the country;
- Share of agriculture and forestry in GDP: 1.1 % in 2016.

Agriculture

- Number of agricultural holdings was about 161,200 in 2016 and has decreased significantly throughout the last decades: -43 % from 1990 to 2016;
- share of holdings with area below 10 ha is more than one third, but strong decrease in number (-58 % from 1990 to 2013);
- share of holdings with area >50 ha is 15 %, increasing numbers (almost +50 %);
- still small structured agriculture, but clear trend to increasing farm size;
- about two third of the holdings and of the agricultural area are situated in less favoured areas (mountainous areas, other less favoured areas and small-structured areas);
- Austria has the highest share of organic farming within the European Union; the number of Austrian organic farms increased from about 1,500 in 1990 to almost 22,000 in the year 2016 which corresponds to a share of around 19% of Austrian farms who manage nearly 22% (appr. 570,000 ha) of the agricultural area in Austria organically;
- the Austrian Agri-environmental programme ÖPUL aims to preserve and promote agricultural practices that make a positive contribution to environment and climate. Important ÖPUL measures in terms of climate are for instance the renouncement of mineral fertilizers, the establishment of green covers on arable land, the gracing of

livestock and the maintaining of permanent grassland as well as reduced tillage or the planting of diversified crop rotations. In 2016, more than 92,000 agricultural holdings participated in the Agri-environmental programme, which accounts for approx. 80% of the farms recorded in the IACS (Integrated Administration and Control System). The total area of land for which ÖPUL support was granted in 2016 was 1.8 m hectares (without alpine areas), which equals a share of around 80% of agriculturally used areas (without alpine pastures). With this high level of participation in the Agri-environmental Programme, Austria has positioned itself as one of the leading EU Member States;

- cattle stock – most relevant for GHG emissions from agriculture – has decreased by about one quarter from 1990 to 2015, the number of dairy cows shows an even stronger decrease;
- average milk yield of dairy cows has increased by about three quarters (from 3.8 t/animal.year in 1990 to 6.6 in 2015) and total milk production has been slightly higher in 2015 than in 1990; emission intensity of milk production has decreased;
- use of synthetic fertilizer has decreased by about one tenth;
- emissions from the agriculture sector have decreased by more than 10 % from 1990 to 2015.

Table 2.13: Land use in Austria 1991 and 2015 in 1000 ha (Data: Farm Structure Survey)

	1991	2015
Arable land	1,423	1,346
Grassland intensive use	886	826
Grassland extensive use	378	274
Mountain pastures	450	363
Vine-yards, orchards	78	60

Table 2.14: Holdings in agriculture and forestry 1990 and 2013 (Farm Structure Survey)

	1990	2013
No. of holdings (1000)	281.9	166.3
operated by full-time farmers	106.5	62.0
operated by part-time farmers	166.2	91.6
operated by associations or legal entities	9.2	12.8
Average size of holdings (ha)	26.8	44.2
operated by full-time farmers	30.5	45.0
operated by part-time farmers	10.0	17.6
operated by associations or legal entities	288.0	230.7

Table 2.15: Livestock in million head

	1990	2015
Dairy cows	0.905	0.534
Suckling cows	0.047	0.224
Other cattle	1.632	1.199
Swine	3.688	2.845
Poultry	13.821	15.772
Other animal	0.434	0.592

Forestry

- Austria is one of the most densely forested countries in Europe with forests covering 48 % of the federal territory;
- wooded area increased by about 4,000 hectares per year in the last years (mainly in agricultural areas and alpine pastures); ever since the beginning of the Austrian Forest Inventory in 1961 a continuous increase in forest cover has been observed in Austria; compared with the first inventory period 1961/1970, the forest cover has increased by almost 300 000 hectares to date;
- annual growth is around 30 million m^3 o.b., annual drain increased from 20 million m^3 o.b. in the 1990ies to 26 million m^3 o.b. with a total standing stock more than 1.1 billion m^3 o.b. (Forest inventory 2007/09); annual drain comprises harvest, natural mortatiliy and salvage logging, the latter increasing in the last two decades;
- Austrian forests have been a net carbon sink during recent decades;
- high share of coniferous trees in the forest area with more than 60 %, most of them spruce; broadleafed wood about one quarter of forest area with increasing tendency; mixed forests are increasing (improving resilience against climate change);
- about one fifth of forest area in Austria is classified as protection forest, which protects its own site, settlements, agricultural areas or other objects against natural hazards;
- sustainable management has been a guiding principle of Austrian forest management policy for more than 100 years, balancing the relevant ecological, economic and social functions; principle is laid down in § 1 of the Austrian Forest Act, which furthermore provides a strict regulatory framework ensuring that all forest functions are maintained;
- in order to balance the various interests in forest utilisation and to assure the many benefits of the Austrian forest in the long term, the Federal Minister of Agriculture, Forestry, Environment and Water Management has adopted the Austrian Forest Programme in 2005 and the Austrian Forest Strategy 2020+ in 2016;
- strategy was jointly developed by 85 organisations involved in forest policy within the scope of the Austrian Forest Dialogue, its primary objective is to ensure and optimise all dimensions of sustainable forest management in a balanced way, paying special attention to the added value and the potential of the Austrian forestry and timber sectors; strategy should help ensure the multifunctional services that forests render for present and future generations.

Table 2.16: Forest area in Austria 1990 and 2015 in 1000 ha (Data: Forest Inventory, Umweltbundesamt)

	1990	2015
Forest land	3,891	4,030

Chapter 3

Greenhouse Gas Inventory Information

3.1 Austrian Greenhouse Gas Inventory

The Austrian greenhouse gas inventory was compiled according to the revised UNFCCC reporting guidelines according to Decision 24/CP.19 and the IPCC 2006 Guidelines for National Greenhouse Gas Inventories.

Austria, as many other European Countries, uses the CORINAIR calculation method (Core Inventory Air) for quantifying national emissions. The national project covering the entire present assessment of Air Emissions in Austria during the reported period is the Austrian Air Emission Inventory (*¨Osterreichische Luftschadstoff-Inventur – OLI*). The OLI figures for Austria's national emissions resulting from the project mentioned above have been transferred to the Revised IPCC 1996 Revised Guidelines format using CORINAIR standard procedures, in order to comply with UNFCCC reporting obligations to ensure comparability of the reported data. No corrections (neither for temperature nor for electricity production share from hydropower) have been applied. Bunker fuels have not been included in the national totals, but tabled separately.

This report shows data from the inventory for the period 1990 to 2015 (NIR 2017 submitted to the UNFCCC secretariat in April 2017). CRF summary tables are shown in Annex A. Differences to figures reported in the last national communication are due to recalculations.

3.2 Emission Trend

- Total emissions of the greenhouse gases[1]: 78.8 Mt CO_2 equivalent in 1990 and 78.9 Mt in 2015, increase of 0.05 Mt;
- emissions peaked in 2005 with 92.6 Mt CO_2-eq.;
- increase mainly in the transport sector, which contributed less than one fifth to total emissions in 1990 and near to one third in 2015;
- two third of the emissions result from fuel combustion;
- CO_2 emissions per capita amounted to 7.7 t in 2015 and total greenhouse gas emissions per capita to 9.1 t CO_2 eq., GHG emissions per GDP (at 2010 prices) to 229 kg CO_2 eq. per € 1000.

[1] CO_2, N_2O, CH_4, HFCs, PFCs, SF_6 and NF_3 (excluding Land Use, Land-Use Change and Forestry)

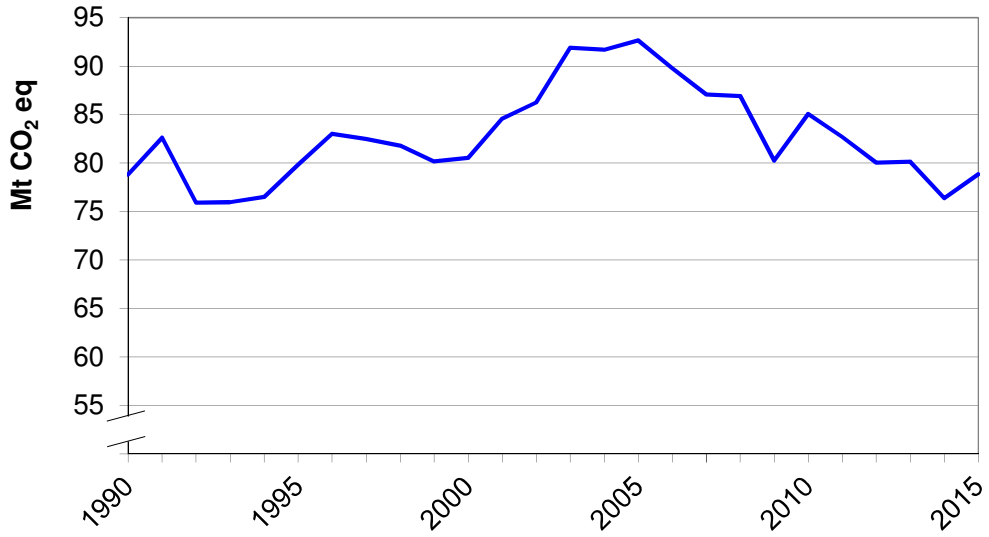

Figure 3.1: Trend in total GHG emissions 1990-2015 (excluding LULUCF)

Table 3.1: GHG emissions 1990 and 2015, in Mt CO_2 equivalent

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990					2015				
	CO_2	CH_4	N_2O	F-Gases	Total	CO_2	CH_4	N_2O	F-Gases	Total
Total without LULUCF	**62.29**	**10.51**	**4.34**	**1.66**	**78.80**	**66.72**	**6.57**	**3.52**	**2.03**	**78.85**
Total with LULUCF	**49.99**	**10.54**	**4.49**	**1.66**	**66.67**	**61.74**	**6.60**	**3.65**	**2.03**	**74.03**
1. Energy	**51.30**	**1.29**	**0.44**		**53.03**	**52.20**	**0.56**	**0.59**		**53.35**
A. Fuel Combustion	51.20	0.69	0.44		52.33	51.98	0.30	0.59		52.87
1. Energy Industries	13.79	0.01	0.04		13.84	10.80	0.03	0.11		10.93
2. Manuf, Industr., Constr.	9.81	0.01	0.07		9.89	10.31	0.02	0.13		10.47
3. Transport	13.78	0.07	0.13		13.98	22.38	0.01	0.20		22.59
4. Other Sectors	13.79	0.61	0.19		14.59	8.45	0.24	0.15		8.84
5. Other	0.04	0.00	0.00		0.04	0.05	0.00	0.00		0.05
B. Fugitive Emiss. from Fuels	0.10	0.60	IE,NA		0.70	0.21	0.26	IE,NA		0.48
2. IPPU	**10.87**	**0.04**	**1.10**	**1.66**	**13.66**	**14.41**	**0.05**	**0.18**	**2.03**	**16.68**
3. Agriculture	**0.09**	**5.41**	**2.69**		**8.19**	**0.11**	**4.57**	**2.49**		**7.17**
4. LULUCF	**-12.31**	**0.02**	**0.14**		**-12.14**	**-4.98**	**0.02**	**0.13**		**-4.82**
5. Waste	**0.03**	**3.78**	**0.12**		**3.93**	**0.00**	**1.40**	**0.26**		**1.66**
6. Other	**NO**	**NO**	**NO**		**NO**	**NO**	**NO**	**NO**		**NO**
Memo Items:										
International Bunkers	0.94	0.00	0.01		0.95	2.18	0.00	0.03		2.21
Aviation	0.89	0.00	0.01		0.90	2.13	0.00	0.02		2.15
Marine	0.05	0.00	0.01		0.05	0.05	0.00	0.00		0.06
Multilateral Operations	NO	NO	NO		NO	NO	NO	NO		NO
CO_2 Emissions from Biomass	10.42				10.42	23.38				23.38

Trend by gas:

- Emissions dominated by CO_2 with 85 % in 2015; CH_4 8 %, N_2O 4 %, F-gases 3 %;
- CO_2 emissions emissions higher in 2015 than 1990, increasing until 2005, decreasing since then; increase due to trend in sector fuel combustion, especially increasing energy consumption in the transport sector;
- CH_4 continuously decreasing since 1990 as a result of the trend in the sectors waste and agriculture;
- N_2O decreasing after 2000, mainly due to a decrease in industrial processes; currently more than two third of emissions from agriculture, which have been decreasing too;
- increase of F-gas emissions: Emissions of SF_6 and PFCs have clearly decreased because of legal restrictions and the termination of primary aluminium production respectively, HFCs increasing due to use as substitute for HCFCs, NF_3 is of minor relevance.

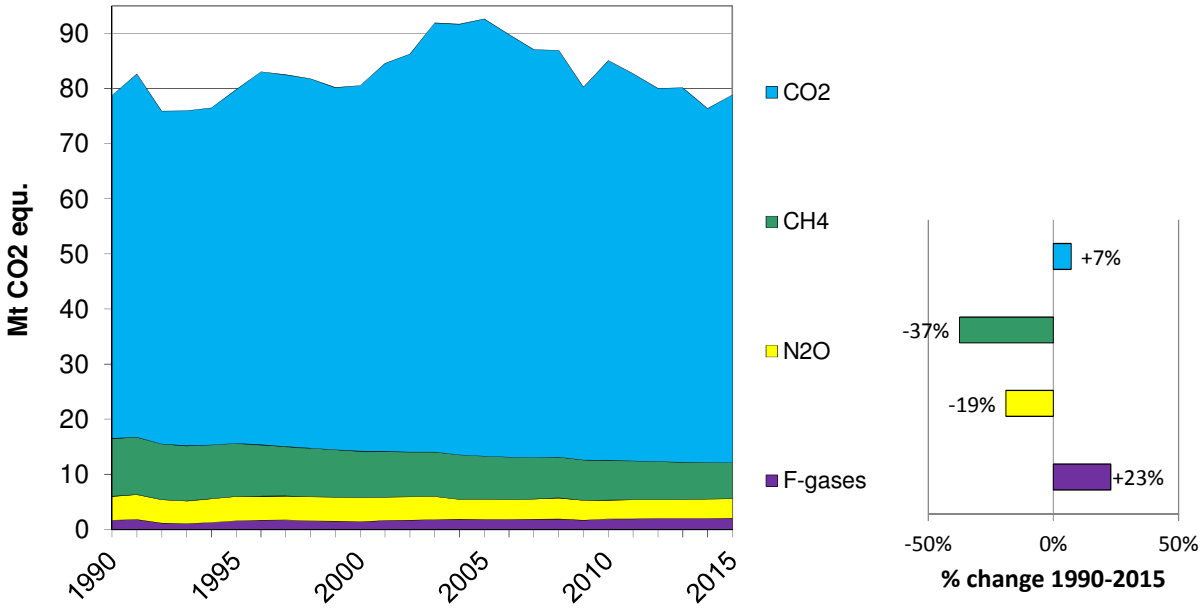

Figure 3.2: GHG emission trend (excluding land-use change and forestry) by gases

Trend by sector:

- Sectoral shares in total GHG 2015: Transport/CRF 1.A.3, 29 %, IPPU/CRF 2 21 %, energy industries/CRF 1.A.1 14 %, manufacturing industries and construction/CRF 1.A.2 13 %, other sectors/ CRF 1.A.4 11 %, agriculture/CRF 4 9 %, waste/CRF 5 2%. The share of most (sub)sectors has been at a comparable level in 1990, with the exception of transport (18 %) and "other sectors" (19 %), the latter showing a noteworthy decrease;
- despite increasing electricity and district heating demand, emissions from energy industries decreased (-21 % from 1990 to 2015) due to a shift from solid and liquid fossil fuels to gas and biomass, increasing contribution of hydro and wind power, more electricity imports as well as increasing efficiency of production;
- production increase in manufacturing industries and construction was the main driving force for the increase of emissions, but emission increase was only 6 % due to a fuel switch to gas and biomass as well as increasing use of electricity instead of combustion processes;

- transport emissions increase (by 8.6 Mt CO_2 eq. or 62 %) caused by increasing inland road transport demand (especially freight transport, but also passenger transport) and by significant increase of fuel export in the vehicle tank; use of biofuels since 2005 and more efficient vehicles in freight transport have attenuated emission growth;
- substantial decrease of emissions from "other sectors" (CRF 1.A.4, -39%) despite population growth and increasing number of dwellings, due to improvement of energy efficiency of the building stock and heating systems, fuel shift from coal and oil to gas and biomass as well as increased use of district heating and heat pumps;
- increase of emissions from industrial processes and product use (+22%) is mainly due to increase in metal production (iron and steel causing three quarters of the sector's emissions, production almost doubled from 1990 to 2015), efficiency measures in the steel industry and by N_2O abatement measures in the chemical industry have slowed down the increase; emission increase of F-gases (see above) contributes to the trend but is small in absolute figures;
- emission decrease in the sector agriculture (-12%) is mainly due to decreasing livestock numbers and lower amounts of fertilizers applied on agricultural soils;
- substantial emission decrease in the waste sector (-58%) due to increasing waste separation, reuse and recycling activities, obligatory pre-treatment of deposited waste with high carbon content and improved recovery of landfill gas.

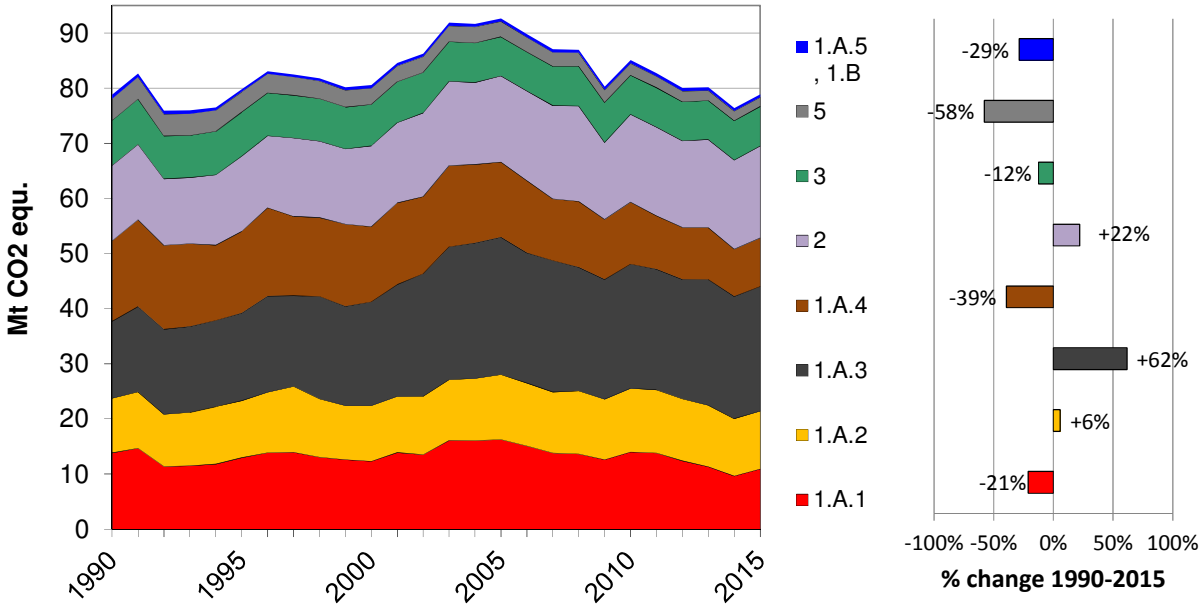

Figure 3.3: GHG emission trend by sectors

3.2.1 Land-use, land-use change and forestry

- Land use, land use change and forestry (CRF 4), which is not included in the national totals shown above, is a net sink in Austria.
- CO_2 removals from that category amounted to 12.3 Mt CO_2 in 1990 and 5.0 Mt in 2015.

- CH_4 emissions remained constant at 0.02 kt CO_2 equivalent.
- N_2O emissions decreased slightly from 0.14 Tg CO_2 equivalent in 1990 to 0.13 Tg in 2015.
- Main CO_2 sinks are subsectors forest land (5.A) with net removals of 4.33 Mt CO_2 in 2015 and harvested wood products (5.H) with net removals of 1.60 Mt, the other subsectors in total are a net source of emissions of less than 1 Mt.

3.2.2 Information according to Art. 7.2 of the Kyoto Protocol

Austria is a member of the Kyoto-Protocol. Austria has fulfilled its obligation under Art. 3.1 of the Protocol for the first commitment period, as stated in the true-up period review report[2].

The following sections describe the information as required according to Art. 7.2 of the Protocol, as laid down in Decision 15/CMP.1[3], with respect to the National Inventory System and the National Registry.

3.3 National Inventory System

As a Party to the United Nations Framework Convention on Climate Change (UNFCCC), Austria is required to produce and regularly update National Greenhouse Gas (GHG) Inventories. The *Umweltbundesamt* is identified as the single national entity with overall responsibility for the national inventory by law. The responsibilities for the inventory planning, preparation and management are specified and are all allocated within the *Umweltbundesamt*.

The national greenhouse gas inventory is prepared by the inspection body for GHG inventories within the *Umweltbundesamt*, an inspection body accredited according to the International Standard ISO 17020 *General Criteria for the operation of various types of bodies performing inspections*. The Quality Management System (QMS) also includes the necessary procedures to ensure quality improvement of the emission inventory. These comprise documentation and attribution of responsibilities of any discrepancy found and of the findings by UNFCCC review experts in particular.

The inventory preparation, including identification of key categories, uncertainty estimates and QC procedures, is performed according to the 2000 Intergovernmental Panel on Climate Change (IPCC) Good Practice Guidance and Uncertainty Management of Greenhouse Gas Inventories. The inventory management as part of the QMS includes a control system for data and calculations, for records and their archiving as well as documentation on QA/QC activities. This ensures the necessary documentation and archiving for future reconstruction of the inventory and for the timely response to requests during the review process.

[2] http://unfccc.int/resource/docs/2016/tpr/aus.pdf

[3] Guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol, II. Reporting of supplementary information under Article 7, paragraph 2

The preparation of the annual inventory includes the recalculation of the whole time-series, taking into account any changes in the time-series of relevant input data (activities and emissions factors).

Part of the legal and institutional arrangements in place as basis for the national system concerns the data availability for the annual compilation of the GHG inventory. The main data source for the Austrian inventory preparation is the Austrian statistical office (*Statistics Austria*). The compilation of several statistics is regulated by law; the compilation of the national energy balance is regulated by contracts only. Other data sources include reporting obligations under national and European regulations and reports of companies and associations.

The final inventory is provided to the responsible ministry (Federal Ministry of Agriculture, Forestry, Environment and Water Management). The inventory is approved and submitted to the UNFCCC Secretariat by the ministry.

The inventory preparation at *Umweltbundesamt* is supported by a quality management system that embeds an inventory improvement plan. This centralized improvement management guarantees the cost-effective allocation of resources to programmes specific for inventory improvement. Improvement programmes are formulated in a continuous process in all inventory sectors and cover the quality of country-specific emission factors, activity data and models.

Examples for these programmes in the latest years are: Improvement of the QMS manual; cooperation (mutual review) with New Zealand with focus on QA)QC process and tools; audits of input data with respect to national production and import/export statistics as well as the main data supplier for LULUCF.

Detailed information on the national inventory system has been reported in Austria's Initial Report[4] according to Decision 13/CMP.1. The Austrian national system was reviewed during the in-country review of the initial report of Austria (February 2007). Para 10 of the review report[5] states that the national system has been developed in line with the relevant guidelines and can fulfil the requirements of the Kyoto Protocol as well as other obligations regarding its air emissions inventory that Austria has to comply with.

The national system has not changed since the submission of the latest national communication.

3.4 National Registry

The registry administrator designated by Austria to maintain the national registry is Umweltbundesamt GmbH. Contact details:
Environment Agency Austria,
Spittelauer Lände 5,

[4] http://unfccc.int/files/national_reports/initial_reports_under_the_kyoto_protocol/application/pdf/at-initial-report-200611-corr.pdf
[5] http://unfccc.int/resource/docs/2007/irr/aut.pdf

A-1090 Wien,
Telephone: +43 1 31304-0,
e-mail: registerstelle@umweltbundesamt.at,
http://www.emissionshandelsregister.at/, http://www.emissionshandelsregister.at/ehr_en/.

The registry is operational since June 2005 and was described in Austria's Initial Report. In June 2012 the national registry migrated to the Consolidated System of EU Registries (CSEUR), which is a common platform for the EU registry and the national registries of the EU member states plus Iceland, Liechtenstein and Norway. Detailed information on this change has been reported in Chapter 13 of the Austrian National Inventory Report 2013[6]. The latest changes are described in Chapter 14 of the Austrian National Inventory Report 2017[7].

[6] http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/aut-2013-nir-15apr.zip
[7] http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/aut-2017-nir-12apr17.zip

Chapter 4

Policies and Measures

4.1 Policy-making Process

Decisions related to policies and measures can be taken at different levels: Legislative measures at the Federation level and the level of the *Länder* ("federal provinces"), administrative measures at federal and *Länder* level, and decision-making of districts and municipalities. The Federal Constitution Act contains detailed provisions on the distribution of legislative power between the Federation and the *Länder*. For different issues, the Constitution Act prescribes either legislative and executive power of the Federation, or legislative power for the Federation and executive power for the *Länder*, or legislative power of the Federation with respect to fundamental principles and legislative power of the *Länder* with respect to implementation issues, or legislative and executive power of the *Länder*. With regard to climate change, legislative responsibility for important policies is shared among the different levels. Private business affairs of Federation, *Länder* and municipalities (e.g. procurement) are managed independently.

The Federation

Legislation at the Federation level usually starts as a government proposal by drafting a bill in one of the ministries – although, in a "normal", but rarely practised, procedure on grounds of the constitution, the parliament takes the initiative for legislation. The ministry co-ordinates its proposal with other ministries and takes into consideration the opinions of different interest groups (consultation phase). Subsequently, the bill is submitted to the Council of Ministers (government). Since unanimity is required in the Council of Ministers, consensus on a bill needs to be provided both politically (i.e. between the parties represented in the government) and technically (between ministries involved). The bills accepted by the Council of Ministers are passed as government bills to the Parliament. The first chamber of the Parliament (Nationalrat) is being constituted every five years after general elections and has the primary legislative power for federal laws. The second chamber (Bundesrat) comprises Members nominated by the nine Länder parliaments and has to vote as well on all federal laws, but its power to over-rule votes of the first chamber is strictly limited.

The implementation of laws at the Federation level is the responsibility of the appropriate ministers, who are either named in the law in question or whose responsibility derives from the Federal Ministries Act. In practice, the implementation of laws is the domain of the administration, i.e. of the ministries and their subordinate administrative units. To a great extent, the *Länder* implement federal laws by way of "indirect federal administration" where the *Länder* authorities are acting in place of federal authorities and are subject to instructions from the federal ministers.

Some examples of federal jurisdiction with respect to climate change are: issues of trade, industry and mining, emissions trading, taxation, price regulation and crisis management for energy supply, transport (e.g. regulations on motor vehicles, infrastructure issues with respect to national railways, roads and waterways).

The *Länder* (Federal Provinces)

The parliaments of the nine *Länder* ("Landtage") are responsible for legislation in those matters, for which the Federal Constitution Act does not assign responsibilty to the Federation. Administration in the *Länder* is subordinate to the *Länder* governments. The *Länder* governments are elected by the *Länder* parliaments; in the majority of the *Länder*, the governments are proportionally comprised of Members of the parties represented in the *Länder* parliament.

Some examples of *Länder* responsibility with respect to climate change are: issues of building construction and small-scale heating systems; road construction and maintenance on regional level; public transport; land-use planning.

However, Article 15a of the Federal Constitution Act opens the possibility to come to agreements among the *Länder* or between *Länder* and the Federation in order to harmonise policies under the respective legal areas of jurisdiction. No party can be forced to enter into such an agreement.

In some important climate change-related policies, legislative power is distributed among the Federation and the *Länder*, e.g. energy policy, waste management and agriculture.

The Municipalities

Local councils as well as mayors and councillors in charge are subject to democratic voting. Municipalities have executive power within the boundaries set by the Federal Constitution Act and by legislation of the Federation and the *Länder*. The Federal Constitution Act provides for autonomy in matters of local interest, which can be pursued within the municipal borders (e.g. building inspection, fire precaution, local planning). With respect to private business affairs, municipalities act as economically autonomous organisations. This authorisation is widely used, e.g. to hire staff, construct buildings and run enterprises for ensuring the needs of everyday life such as drinking-water supply, waste disposal or nursery schools.

Policies and measures with respect to climate change at the municipal level range from land-use planning, public transport, local road construction and parking restrictions to public buildings and procurement.

European Union

Austria is Member State of the EU. Legislation on EU level is initiated by the European Commission and enacted by the Council and the Parliament. Implementing and delegated legislation is in the responsibility of the Commission. Important climate specific legislation has been enacted at EU level, especially on the EU Emission Trading System and on effort sharing for reaching EU mitigation targets. EU legislation in the areas of energy, industry, transport, buildings, agriculture and waste has considerable influence on reaching the targets.

4.2 Domestic and regional Programmes, legislative Arrangements, enforcement and administrative Procedures

Administrative Procedures

The Federal Ministry for Agriculture and Forestry, Environment and Water Management has a co-ordinating function with respect to the overall climate change policy in Austria. However, responsibility for measures to reduce greenhouse gas emissions and to fulfil other obligations of the UNFCCC and the Kyoto Protocol is distributed among several federal ministries and other territorial authorities (*Länder*, municipalities). The *National Climate Change Committee* has been installed by law and supports the co-ordination of climate change related measures. It comprises high level representatives of the federal ministries involved in climate change and the *Länder*,) of the "Social Partners", as well as representatives from science, energy and industry interest groups, environmental NGOs and the political parties represented in the first chamber of the Parliament (Nationalrat). The committee is co-chaired by the Head of Environment Department of the Federal Ministry of Agriculture, Forstry, Environment and Water Management (BMLFUW) and one representative of the *Länder*, alternating on a rotation basis.

Programmes

The Austrian Climate Change Act lays down individual emission target paths for the relevant sectors in order to meet the 2020 emission target under EU legislation (*EU Effort Sharing Decision*). A first programme, covering measures ready to implement in the course of 2013 and 2014, has been prepared in the National Climate Change Committee and adopted by the Federal Government and the *Länder* in 2013. An update of the programme has been adopted in 2016.

Most *Länder* (e.g. Vienna, Upper Austria, Lower Austria, Salzburg) have formulated their own regional climate change programmes, taking into account specific regional circumstances, needs and areas of responsibility. These programmes ideally supplement the national programme, which can only describe at an abstract level framework conditions and guidelines for provincial action.

Legislative arrangements and enforcement

The legislative arrangements for the implementation of the national programme are different for each of the strategy's elements. As described in the first section, areas of responsibilty are spread among ministries as well as between the Federation, *Länder* and

municipalities. That is why there is no uniform legal basis for national policies and policy instruments to mitigate climate change. The legal basis ranges from, e. g., the Environmental Support Act and the Green Electricity Law at Federation level to the Technical Construction Regulations for buildings on *Länder* level. Administrative procedures for implementation and monitoring are as well different for the diversity of instruments; for this reason there is no unified framework for the monitoring of policies and measures. Enforcement rules are laid down in the respective legal acts as appropriate. All legal acts are published and made available to the public.

Quantitative sectoral targets and administrative responsibilities to fulfil international and European climate change commitments are laid down in the Austrian Climate Change Act ("Klimaschutzgesetz", Federal Law Gazette I No. 106/2011). It defines processes on how to develop climate strategies and provides for appropriate (aforementioned) institutional arrangements. The Federal Minister for Agriculture and Forestry, Environment and Water Management reports annually to the Climate Change Committee and to the Parliament on progress with respect to the targets of the Climate Change Act. If targets are not met, the Climate Change Act triggers negotiations on additional measures to meet the targets.

The Austrian JI/CDM Programme, based on the Environmental Support Act, is the national instrument for the participation in the mechanisms under the Kyoto Protocol. The programme is managed by Kommunalkredit Public Consulting (KPC) and controlled by a committee consisting of representatives of federal ministries, *Länder*, social partners and representatives of the political parties represented in the first chamber of the Parliament. The JI/CDM Programme is expected to play a minor role during the second commitment period of the Kyoto Protocol, as Austria intends to reach the target by domestic measures.

4.3 Policies and Measures and their Effects

Policies which lead to a mitigation of GHG emissions date back to the early 1990ies, as Austria's early National Communications under the UNFCCC have illustrated. The previous chapters show that emissions of some sectors have clearly decreased due to implemented measures.

Policies and measures described below contribute to the relevant greenhouse gas mitigation goals:

- The obligation under Article 4 of the Convention;
- the quantified economy-wide emission reduction target of the EU and its Member States documented in FCCC/SB/2011/INF.1/Rev.1;
- the national target for 2020 under the *EU Effort Sharing Decision*, which serves to implement
    - the quantified economy-wide emission reduction target listed above and described in detail in Chapter 2 of the Biennial Report;
    - the target for the second commitment period under the Kyoto Protocol according to the Doha Agreement, which has not yet entered into force.

Furthermore the measures are the basis for further emission reductions in order to achieve the target under the Paris Agreement. On EU level, negotiations for the new *Effort Sharing*

Regulation are conducted, which will lay down the individual reduction targets of the Member States.

It should be taken into account that many policy instruments are seen as multifunctional and have been introduced for other reasons too, besides climate change mitigation, e.g. for diversification of energy supply, mitigation of air pollution or reduction of noise from transport, or even for social policy reasons (e.g. housing support schemes).

Preparations for the energy and climate strategy for 2030 have already begun in Austria; the early election of the Parliament in autumn 2017 has temporarily stopped that work. Consensus on a set of planned policies and measures to meet the 2030 target has not yet been reached; this is why no planned PaMs are shown in this chapter. (The 2020 target is expected to be reached with PaMs which have already been implemented or adopted.) All measures listed below are taken into account in the WEM scenario.

All policies have been maintained since the Second Biennial Report; the structure follows closely that of the BR2. All policies are expected to modify the long term emission trend by sustainable structural and behaviour changes and by reducing emission intensity and improving efficiency in the sector affected, e.g. by increasing the stock of power generation units and heating systems based on renewable energy, by fostering energy efficient production, efficient building stock and environmentally sound transport infrastructure, by modifying the choice of transport modes and of working methods in agriculture, by reducing the carbon content of landfills etc.

More details of the policies and some instruments to implement these policies can be found in Chapter 4 of the latest report on Austria's GHG emission projections "GHG Projections and Assessment of Policies and Measures in Austria" (http://www.umweltbundesamt.at/fileadmin/site/publikationen/REP0610.pdf)

All emissions are reported in carbon dioxide equivalent values and have been converted from each gas on the basis of global warming potentials (GWP) as agreed upon by the Conference of the Parties.

The "Energy" sector as defined in the reporting guidelines covers policies in energy industries and manufacturing industries ((CRF 1.A.1, 1.A.2) as well as policies in the buildings sector (CRF 1.A.4) which are listed separately below, the "Industry/industrial processes" sector as defined in the reporting guidelines covers policies in the industrial processes and product use sector listed below (CRF 2). Transport, agriculture and waste are equivalent to the CRF definitions.

4.3.1 Cross-cutting Policies

EU Emission Trading Scheme

The EU Emission Trading Scheme is the most important policy for installations with high energy demand and CO_2 emissions in energy industries, manufacturing industries and industrial processes, as well as N_2O emissions from chemical industry. Its objective is to limit

emissions by means of trading allowances, which have initially been allocated for free or auctioned. More than 200 Austrian installations are covered by the EU ETS.

The EU ETS (Directive 2003/87/EC as amended) is implemented in Austrian law with the Emissions Allowance Trading Act (Emissionszertifikategesetz 2011 - Federal Law Gazette I No. 118/2011 as amended).

From 2013 onwards, a fully harmonised system for allocation of free allowances is being applied, based on the revision of the ETS Directive (2009/29/EC). Rules on free allocation for stationary installations covered by the scheme are strictly harmonised within the EU, combined with a Union-wide cap, which is characterised by a linear factor that provides for the reduction of GHG emissions by 21% to be achieved in 2020 relative to 2005. So called "National Implementation Measures" need to strictly follow the rules for free allocation, laid down in the "Benchmarking Decision" by the European Commission. For most activities, free allocation is calculated on the basis of product or heat benchmarks, which are derived from the 10 % most efficient installations in Europe.

GHG affected: CO_2, N_2O
Type of policy: Regulatory, economic
Implementing entity: Federal government
Mitigation impact: n.a.

The Domestic Environmental Support Scheme

The *Domestic Environmental Support Scheme* in general provides financial support for projects which improve environmental performance beyond mandatory standards in energy, manufacturing as well as service industry. Projects may be related to all greenhouse gases. Focus areas in the climate change context comprise projects to improve energy efficiency, promote the use of renewable energy sources, decrease waste and promote sustainable transport.

The legal basis is the Austrian Environmental Support Act, the scheme is administered by Kommunalkredit Public Consulting (www.publicconsulting.at/eng).

In 2015 support of about EUR 56 million has been granted for projects with relevance for GHG mitigation, in 2016 about 46 million. These projects are expected to bring about a current emission reduction of about 300 kt CO_2 p. a. and of 5.6 million tonnes over the whole life time of the projects. (An evaluation of the effect of all projects implemented over the years for a specific target year is not available.)

GHG affected: Focus on CO_2, in principle all gases
Type of policy: Economic
Implementing entity: Federal government
Mitigation impact: n. a.

Austrian Climate and Energy Fund (KLI.EN)

The *Austrian Climate and Energy Fund (KLI.EN),* financed by the Federal Ministry of Agriculture, Forestry, Environment and Water Management and the Federal Ministry of Transport, Innovation and Technology, has been established in order to support the reduction of GHGs in Austria in the short, medium and long term. It focuses on research in and development of renewable energy systems, development and testing of new transport and mobility systems and market penetration of GHG mitigation measures.

The legal basis of the Fund is the Climate and Energy Fund Law ('Klima- und Energiefondsgesetz' Federal Law Gazette I No. 40/2007), its objective is to contribute to meeting Austria's climate change commitments by funding of climate and energy related projects. The funding should bring about a long-term transformation to a climate-friendly energy system. Two relevant funding concepts of the recent years are "Model Regions" to help climate-friendly energy and mobility systems to be successful at the regional level and "Flagship Projects" to help new technical developments to be actually tested and implemented. In 2015 and 2016 support of about EUR 183 million has been granted.

GHG affected: CO_2
Type of policy: Economic, research
Implementing entity: Federal government
Mitigation impact: n. a.

4.3.2 Policies in energy industries and manufacturing industries

The policies relevant for energy and manufacturing industries focus on the reduction of CO_2 emissions from fossil fuels.

Increase the share of renewable energy in power supply and district heating

Increasing the share of renewable energy sources in the public power and heat supply is the main policy to reduce climate impacts of the energy system. Large-scale hydro power for electricity generation has delivered a significant contribution to power supply since the first half of the last century.

In order to provide for further growth of renewable sources, quantitative targets for 2020 for the increase of the share of wind power, photovoltaics, small hydro plants and biomass/biogas in electricity generation have been laid down in the Green Electricity Act and shall be achieved by fixed feed-in tariffs. After similar previous regulations the current instrument to achieve this policy target is the Green Electricity Act 2012 (Federal Law Gazette I No. 75/2011 as amended) and the respective Feed-in Tariff Ordinance. Tariff support is provided for plants installed until 2020 for a limited period.

For biomass-based district heating systems investment support is granted under the Domestic Environmental Support Scheme and serves to increase the share of biomass in heat supply.

GHG affected: CO_2

Type of policy: Regulatory, economic
Implementing entity: Federal government
Mitigation impact: 4,200 kt CO_2 eq in 2020 (green electricity only)

Increase energy efficiency in energy and manufacturing industries

Efficiency increases are essential to limit growing demand for energy and fuels and their environmental impacts. Austria has implemented EU legislation (Energy efficiency Directive 2012/27/EU) through the Energy Efficiency Act (Federal Law Gazette I No. 72/2014), which specifies an energy efficiency target for 2020 and obligations for large companies and energy suppliers. An Energy Efficiency Action Plan has to be compiled and updated every three years.

In addition, financial support for cogeneration of power and heat is granted in order to improve the efficient use of primary energy for electricity production (Combined Heat and Power Act, Federal Law Gazette I No. 111/2008 as amended). Due to unfavourable market conditions for gas-based CHP plants the effect of this regulation is currently estimated to be quite low.

GHG affected: CO_2
Type of policy: Economic, regulatory
Implementing entity: Federal government, federal provinces
Mitigation impact: n.a.

4.3.3 Policies in the transport sector

The policies relevant for transport focus on the reduction of CO_2 emissions from fossil fuels, but there is also some effect on N_2O emissions from catalytic exhaust gas cleaning in cars.

Increase the share of clean energy sources in road transport

The substitution of fossil fuels by clean energy sources is an important and well established policy in the transport sector. Starting with the Biofuels Directive 2003/30/EC, the EU has in place legislation on the promotion of renewable energy sources in transport. Currently the Renewable Energy Sources Directive 2009/28/EC requires Member States to replace at least 10% of the fossil fuels used in transport by renewables by 2020. (Target includes biofuels and electricity from renewable energy sources in rail transport as well.)

The Directive has been implemented into national law by the Austrian Fuel Ordinance (Federal Law Gazette II No. 398/2012) which stipulates minimum targets for the share of biofuels (fatty-acid methyl ester and ethanol) in diesel and gasoline sold in Austria. The minimum share targets have been raised over time (currently 5.75 %, from 2020 onwards 8.45 %). A further instrument is funding through the consulting and funding programme “klimaaktiv mobil” (conversion of municipal and company fleets to run on pure biofuels).

The national Implementation Plan for electric mobility, a joint initiative of three federal ministries, aims at a (in the short term moderate) electrification of road transport; funding instruments are used to increase the share of electric vehicles and plug-in hybrid vehicles from less than 0.1% in 2013 to about 1 % of the fleet in 2020. RTD-funding of the Climate and Energy Funds is expected to contribute in the longer term to an expansion of electric road mobility.

GHG affected: CO_2
Type of policy: Regulatory, economic, research
Implementing entity: Federal government
Mitigation impact: 4,800 kt CO_2 eq in 2030

Increase fuel efficiency of road transport

Energy demand for transport has more than doubled in the last three decades (partly due to increasing fuel export in the vehicle tank, however). Increasing fuel efficiency was therefore an essential policy to limit that growth. Efficiency of motors and vehicles has in principle improved due to technical progress. In freight transport real world performance of vehicles on the road has improved (due to inherent economic incentives of that sector). In passenger transport, however, consumer behaviour (i.e. desire for larger cars and higher engine power) has weakened or counteracted that trend.

Instruments for increasing efficiency need to foster the choice of vehicles with low specific consumption and their efficient use. Fuel tax according to the Mineral Oil Tax Act (Federal Law Gazette No. 630/1994 as amended) is directly related to fuel consumption on the road, the tax rate has last been raised in 2011. Fuel consumption based car registration tax according to the Standard Consumption Levy Act (Federal Law Gazette No. 695/1991 as amended) is expected to promote the sales of passenger cars with lower fuel consumption; taxable base is the price of the car, the tax rate increases parallel to the standard fuel consumption and therefore penalises cars with high consumption. (Cars with CO_2 emissions below 90g/km and electric vehicles are exempt from registration tax.)

Awareness raising and training programmes for fuel-efficient driving improve performance of drivers, fuel-efficient driving has also become part of the training in driving schools. Trainings for drivers of passenger cars, buses and heavy duty vehicles have been established by the programme “klimaaktiv mobil”, 5–15 % lower CO_2 emissions can be achieved compared to conventional driving behaviour.

Other instruments like speed limits (which have been established due to other environmental concerns) and the mileage based lorry toll on highways (with lower rates for modern vehicles) contribute to reduced fuel consumption.

GHG affected: CO_2
Type of policy: Fiscal, information, regulatory, economic
Implementing entity: Federal government, federal provinces
Mitigation impact: 1,300 kt CO_2 eq in 2030

Modal shift to environmentally friendly transport modes

Although Austria belongs to the EU Member States with the highest share of rail transport in the modal split, a further shift to environmentally friendly transport modes with a lower energy demand is essential for decreasing GHG emissions. Considerable investments have been made in railway infrastructure in the last decade, as increased capacity is a prerequisite for enhancing rail transport and as railway stations had to be modernised to become an attractive place for passengers. An extension of the public transport network is also under implementation in Vienna, especially with respect to the underground lines.

The programme "klimaaktiv mobil" for mobility management and awareness raising is an essential tool to promote environmentally friendly transport modes like public transport, cycling and walking. It is funded by the Federal Ministry of Agriculture, Forestry, Environment and Water Management. The cornerstones of "klimaaktiv mobil" are the funding programme for businesses, communities and associations, target group-oriented counselling programmes, awareness-raising initiatives, partnerships, and training and certification initiatives.

In order to provide a sufficient service offer in public transport, the *Länder* order and pay for certain train and bus services which would be uneconomical for the public transport companies otherwise. With respect to freight transport, investment support for corporate feeder lines aims at shifting transport activities from road to rail.

GHG affected: CO_2
Type of policy: information, economic
Implementing entity: federal government
Mitigation impact: 500 kt CO_2 eq in 2030

4.3.3 Policies in the buildings sector

The policies relevant for the buildings sector focus on the reduction of CO_2 emissions from fossil fuels.

Increase energy efficiency of buildings

Improving the energy efficiency of buildings, including their heating systems, is for quite some time one of the most effective policies to reduce the carbon footprint of the Austrian population.

Construction standards with respect to the energy demand of new residential and non-residential buildings and criteria for the renovation of buildings are laid down in guidelines by the Austrian Institute for Constructional Engineering ("OIB Guideline 6 – Energy saving and thermal insulation"). Standards for the heat demand have been supplemented by standards for the total energy demand of buildings (including e.g. warm water and cooling). The requirements are based on the EU Directive on the energy performance of buildings (2010/31/EC) and are therefore tightened in regular intervals in order to achieve a 'nearly zero energy' building standard which will comply with the target of the EU Directive in 2020.

The *Länder* are responsible for translating this guideline into their respective regional building law. Furthermore, energy performance certificates have to be provided by sellers and landlords in the course of real estate transactions or rentings.

Besides the mandatory standards funding is granted for the construction of residential buildings with advanced efficiency standards (housing support schemes of the *Länder*) and for the thermal renovation of buildings (including heating systems) within several programmes, e.g. the support schemes of the *Länder* and the federal "renovation cheque" initiative for residential buildings and a programme within the environmental support scheme for commercial and industrial buildings. In addition, the federal programme klimaaktiv as well as regional energy agencies of the *Länder* provide consulting and advice on these issues.

GHG affected: CO_2
Type of policy: Regulatory, economic, information
Implementing entity: Federal government, federal provinces
Mitigation impact: 440 kt CO2 eq in 2020, 610 kt in 2030

Increase the share of renewable energy for space heating

Apart from the efficiency of buildings, the type of energy source is crucial for greenhouse gas emissions from this sector. Financial support for biomass and solar heating systems (new buildings, boiler replacement) is provided for households via funding of the *Länder* and of the Climate and Energy Funds, support for commercial and industrial applications by the domestic environment support scheme. Support is supplemented by awareness raising measures on federal (klimaaktiv programme) and on *Länder* level.

The District Heating and Cooling Act (Federal Law Gazette I No. 113/2008 as amended) aims at the construction of district cooling systems in order to reduce electricity demand for air conditioning, as well as at the expansion of district heating networks based on waste heat from industry and renewable energy sources; subsidies are provided for that purpose.

GHG affected: CO_2
Type of policy: Economic, regulatory
Implementing entity: Federal government, federal provinces
*Mitigation impact: 59*0 kt CO_2 eq in 2020, 1,320 kt in 2030

Increase of energy efficiency in residential electricity demand

An increase of energy efficiency in residential electricity demand as a further policy target is achieved by important instruments at EU level, especially the eco-design requirements for energy using products (Directive 2009/125/EC and implementing acts) and the mandatory labelling of household appliances according to energy consumption (Directive 2010/30/EU and delegated acts). These instruments are supported by awareness raising measures at national level with respect to energy efficient products and by advice provided by regional energy agencies.

GHG affected: CO_2

Type of policy: Regulatory, information
Implementing entity: Federal government, federal provinces
Mitigation impact: n. a.

4.3.6. Policies in the industrial processes and product use sector

EU Emission Trading Scheme and the *Environmental Support Scheme* – both described under "cross-cutting" – are the leading policies and measures with respect to CO_2 and N_2O mitigation in this sector. Further measures focus on the use of F-gases.

Reduce emissions from F-gases and other product use

Mitigation of F-gas emissions has been early targeted by national policy. National bans for certain uses have been enacted since 2002 (Federal Law Gazette II No. 447/2002 as amended): The used of SF_6 is prohibited for most applications, the use of HFCs and PFCs banned e.g. for the production of foam materials.

National regulations have been complemented by EU law at a later stage: Provisions for the maintenance of refrigeration and air conditioning systems aim at a minimisation of emissions, EU Regulation No 517/2014 has introduced a quota system for production and imports and enhanced use restrictions. For air conditioning systems in passenger cars the use of refrigerants with GWPs higher than 150 has been prohibited for new models since 2013 and is completely banned for new cars since 2017.

CO_2 emissions from organic solvents are of limited relevance; it may be mentioned that legislation to reduce emissions from solvent use in industry and due to paint application exists at national and EU level.

GHG affected: HFCs, PFCs, SF_6, (CO_2)
Type of policy: Regulatory
Implementing entity: Federal government
Mitigation impact: n. a.

4.3.7 Policies in the agriculture sector

The policies relevant for agriculture focus on the reduction of CH_4 and N_2O as well as of CO_2 emissions.

Implementation of EU agricultural policies

The implementation of EU agricultural policies in Austria puts, i. a., a focus on environmental sound farming practices for Austria's largely small-structured agricultural system. The

Austrian Agri-Environmental Programme has already foreseen funding for actions like reduced use of mineral fertilizers or organic farming etc. in the periods before 2013. The reform of the common agricultural policy at EU level in 2013 (Regulation (EU) No 1305/2013) has brought about some changes regarding direct payments and the requirement to maintain land in good agricultural and ecological condition ("cross-compliance"). The Austrian Agri-Environmental Programme is maintained for the period 2014–2020, important approaches to reduce greenhouse gases within the ÖPUL are e.g. organic farming, renouncement of mineral fertilizers, greening of arable land, grazing of livestock, maintenance of grassland, application of low impact tillage methods, low-loss applications of manure, as well as education and trainings in terms of soil fertility/ building up of humus. Other relevant actions within the Austrian Rural Development Programme are e.g. the covering of manure storages as well as education and trainings in terms of climate (e.g. improved feeding of pigs and poultry).

GHG affected: CH_4, N_2O
Type of policy: Regulatory, economic
Implementing entity: Federal government, federal provinces
Mitigation impact: n. a.

4.3.4 Policies in the waste sector

Reduce emissions from waste treatment

Emissions from the waste sector are clearly dominated by solid waste disposal, the policy focus has therefore been on the avoidance of emissions from landfills. Main principles of the Austrian Waste Management Act (Federal Law Gazette I No. 102/2002 as amended) are a. o. the prevention of waste and waste recovery/recycling (including incineration with energy recovery). Due to the Austrian Landfill Ordinance the deposition of untreated biodegradable waste has been banned completely. Methane emissions from old landfills are reduced by the mandatory collection and use of landfill gas.

The carbon content of waste is reduced by incineration and the biodegradability of waste is reduced by mechanical-biological treatment before deposition. Due to their size, more than half of existing mechanical-biological treatment plants fall under the scope of the EU Industrial Emissions Directive; emission have to be limited according to BAT provision.

GHG affected: CH_4, N_2O
Type of policy: Regulatory
Implementing entity: Federal government, federal provinces
Mitigation impact: n. a.

4.3.8 Policies in the LULUCF sector

Some policies in sectors described above also affect sources and sinks in the LULUCF sector. In the agriculture sector, several actions within the Austrian Agri-environmental Programme ÖPUL (Agriculture) have a positive effect on the enhancement of carbon stocks in the agricultural environment and especially in soils, e.g. reduced tillage and organic farming. Energy-related policies to increase the share of renewables in the sectors industry, transport and buildings may have indirect impacts on the LULUCF sector, e.g. as an incentive to increase biomass harvest.

LULUCF Action

Within the LULUCF sector, forest land (CRF 4.A) has by far the largest share in total emissions/removals from this sector. Sustainable forest management has been a guiding principle of Austrian forest management policy for more than 100 years, balancing the relevant ecological, economic and social functions. Austrian forest management mainly focuses on the targets to maintain biodiversity, productivity, regeneration capacity and vitality of forests and to improve adaptation to changing – specifically climatic – conditions. Principles of forest management in Austria and specific provisions are stipulated in the Forest Act (Federal Law Gazette I No. 1975/440, as amended), e.g. general bans on forest clearance/deforestation and on forest destruction, the requirement of reforestation after felling, restrictions on forest litter removal, provisions on harvest haulage and forest protection. The Austrian Programme for Rural Development 2014-2020 also provides for support measures, e.g. for preventive action to protect forests from forest fires and natural disasters as well as to restore forest ecosystems after those events, and for increasing the resilience of forest ecosystems. At present, the harvest rate is around three quarter of timber growth in Austria. As described above, Austria strives to increase biomass harvest in a sustainable manner.

Details are listed in the Austrian LULUCF Action Plan[1] which has been submitted to the European Commission according to Decision 529/2013/EU ("LULUCF Decision") and its mid-term evaluation[2]).

GHG affected: CO_2
Type of policy: Regulatory
Implementing entity: Federal government, *Länder*
Mitigation impact: n. a.

[1] https://www.bmlfuw.gv.at/dam/jcr:6449432b-022a-488e-a388-6d016e2d6abf/LULUCF%20Aktionsplan.pdf
[2] https://www.bmlfuw.gv.at/dam/jcr:94c54b47-cb4a-460a-ac40-aee91c31c149/LULUCF%20Aktionsplan%20-%20Halbzeitevaluierung.pdf

Table 4.3: Summary of policies and measures by sectors

Name of PaM	Objective and/or activity affected	GHG affected	Type of instrument	Status	Implem. entity or entities	Mitigation impact [kt CO_2 eq]	
						2020	2030
Cross-cutting							
EU Emission Trading Scheme (ETS)	framework policy multi-sectoral policy	CO_2, N_2O	Economic, regulatory	Implem.	Federal government	n. a.	n. a.
Domestic Environmental Support Scheme	framework policy multi-sectoral policy	CO_2, CH_4, N_2O	Economic	Implem.	Federal government	n. a.	n. a.
Austrian Climate and Energy Fund (KLI.EN)	framework policy multi-sectoral policy	CO_2	Economic, research	Implem.	Federal government	n. a.	n. a.
Energy industries and manufacturing industries							
Increase the share of renewable energy in energy supply and district heating	increase in renewable energy	CO_2	Regulatory, economic	Implem.	Federal government	4,200	n. a.
Increase energy efficiency and use of renewables in energy and manufacturing industries	efficiency improvement in the energy and transformation sectorswitch to less carbon-intensive fuels	CO_2	Economic, regulatory	Implem.	Federal government, federal provinces	n. a.	n. a.
Transport							
Increase share of clean energy sources in road transport	low carbon fuels/electric cars	CO_2	Economic, regulatory	Implem.	Federal government	n. a.	4,800
Increase fuel efficiency of road transport	- efficiency improvements of vehicles and driving behaviour	CO_2	Economic, fiscal, information, regulatory	Implem.	Federal government, federal provinces	n. a.	1,300
Modal shift to environmentally friendly transport modes	- demand management/reduction - modal shift to public transport or non-motorized transport - improved behaviour	CO_2	Information, economic	Implem.	Federal government	n. a.	550

Name of PaM	Objective and/or activity affected	GHG affected	Type of instrument	Status	Implem. entity or entities	Mitigation impact [kt CO_2 eq]	
						2020	2030
Buildings							
Increased energy efficiency of buildings	efficiency improvements of buildings	CO_2	Regulatory, economic, information	Implem.	Federal government, federal provinces	440.	610
Increased share of renewable energy for space heating	efficiency improvements of buildings	CO_2	Economic, regulatory	Implem.	Federal government, federal provinces	50ß	1,320
Increased energy efficiency in residential electricity demand	efficiency improvement of household appliances and in service/tertiary sector	CO_2	Regulatory, information	Implem.	Federal government, federal provinces	n. a.	n. a.
Industrial processes and product use							
Decrease emissions from F-gases and other product use	- reduction of emissions of fluorinated gases - installation of abatement technologies	HFCs, PFCs, SF_6,	Regulatory	Implem.	Federal government	n. a.	n. a.
Agriculture							
Implementation of EU agricultural policies	- improved cropland management and reduced fertilizer/manure use - improved livestock and manure management - activities improving grazing land or grassland management	CH_4, N_2O	Regulatory, economic	Implem.	Federal government, federal provinces	n. a.	n. a.
LULUCF							
LULUCF action	sustainable management - producing bio-based material for the promotion of the bio economy, including biomass and - protecting or further increasing carbon stocks	CO_2	Regulatory	Implem.	Federal government, federal provinces	n. a.	n. a.
Waste							
Reduce emissions from waste treatment	improved treatment technologies, improved landfill management	CH_4, N_2O	Regulatory	Implem.	Federal government, federal provinces	n. a.	n. a.

4.4 Information according to Art. 7.2 of the Kyoto Protocol

This section describes the information as required according to Art. 7.2 of the Protocol, as laid down in Decision 15/CMP.1[3], with respect to promoting sustainable development, bunker fuels and the minimisation of adverse effects. Information on domestic programmes, legislative arrangements, enforcement and administrative procedures is presented in Section 4.2.

Sustainable development has been a guiding principle for policy-making in Austria for a long time. An explicit strategy document of the Federal Government has been adopted in 2002 ("Austrian Strategy for Sustainable Development 2002"[4]). Building upon that document and upon the EU's sustainable development strategy, the Federal Government and the *Länder* have developed a common strategy, which has been adopted in 2010[5]. It takes into account the UN Millenium Development Goals and is intended as guidance for policy and administration. The work programme contains topics like "global responsibility" and "sustainable production, consumption and transport". Indicator based monitoring is performed biennially[6]. At EU level, the European Commission has presented a sustainable development package in 2016, which is expected to mainstream the SDGs into EU (and further Member States) policies.

Austria is aware of the need to reduce *greenhouse gas emissions from aviation and shipping*. Austria supports EU work on that subject in ICAO and IMO. The EU, with active support from Austria, succeeded to include aviation CO2 emissions into the EU emissions trading scheme from 2012 onwards, resulting in a limitation of emissions below historic levels in 2004-2006. The EU scheme includes emissions from flights European Economic Area, and an agreement with Switzerland has been signed in 2017 on the linking of the EU ETS with the Swiss Trading Scheme. The EU has also been the driving force behind the ICAO agreement on a global market-based measure to limit GHG emissions from international aviation (Carbon Offsetting Scheme for International Aviation - Corsia), which will be operational from 2021. Austria, together with all Member States of the EU, will be among those countries participating in the voluntary pilot phase. Appropriate action has also been implemented at European level for maritime transport (monitoring and reporting on GHG emissions of ships).

According to paragraph 36 of the Annex to decision 15/CMP.1, each Party to the Kyoto Protocol shall provide information not reported elsewhere under these guidelines on how it strives to implement policies and measures under Article 2 of the Protocol in such a way as to minimize adverse effects, including the adverse effects of climate change, effects on international trade, and social, environmental and economic impacts on other Parties, especially developing country Parties and in particular those identified in Article 4, paragraphs 8 and 9, of the Convention, taking into account Article 3 of the Convention.

[3] Guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol, II. Reporting of supplementary information under Article 7, paragraph 2

[4] https://www.nachhaltigkeit.at/assets/customer/Downloads/Strategie/strategie020709_en.pdf

[5] https://www.nachhaltigkeit.at/strategien (in German language)

[6] https://www.nachhaltigkeit.at/bewertung/MONE (in German language)

Policies and measures reported in this chapter are implemented in order to minimise adverse affects of climate change.

The Kyoto Protocol is, in principle and in general, designed to minimize adverse effects on specific sectors, specific industries or specific trade partners of a Party, including effects on international trade, and social, environmental and economic impacts on other Parties. This is due to the fact that a. o. it does not limit action to a single gas or a single sector and that it requests action to support the least developed countries. By striving to implement the features of the Protocol, Austria is naturally working to minimize any adverse effects due to the reduction of greenhouse gas emissions.

Austria is acting together with other Parties in the EU to jointly fulfil the commitments under the Protocol. Key climate policies (e.g. the EU Emissions Trading System and the Effort Sharing between Member States) are established at an EU level. While these policies are executed at the national level, they are not monitored and assessed by individual Member States, but by the EU as a whole. The EU reports in detail on how it strives to minimize adverse effects in its annual national inventory report, to which we hereby refer for further information.

Austria also seeks to ensure that response measures designed and implemented entirely at the national level are as targeted and effective as possible. Since 2013, we have compulsory, government-wide impact assessments concerning environmental, economic and social consequences of policies and measures. These assessments target all policies and measures, including measures to combat climate change, and require information on: The Austrian Federal budget, economic impacts (GDP, employment, costs for SMEs, etc.), social impacts (consumers, youth, etc.), environmental impacts (climate change; air and water quality; biodiversity; energy and waste), gender equality.

The information is generated through a government-wide common IT template and resulting documents are published on the website of the Austrian Parliament as part of the package of accompanying materials of legislative proposals.

The main focus of the assessments is on effects at the national level, but this does not rule out that assessments also consider international effects. In fact, economic effects of measures cannot be analysed in isolation and will necessarily address trade-related effects as well.

We note that effects (impacts) of climate change response measures can be both positive and negative, and that maximising positive economic, social and environmental impacts (co-benefits) through good policy design is an important aspect in incentivising climate action at the national, regional and global level.

Chapter 5

Projections and the Total Effect of Policies and Measures

5.1 Projections

5.1.1 Introduction

The latest national greenhouse gas (GHG) emission projections have been developed in the years 2016/2017. The "with measures" scenario (WM) takes account of climate change mitigation measures that were implemented and adopted before June 2016. Preparations for the energy and climate strategy for 2030 have already begun in Austria; the early election of the Parliament in autumn 2017 has temporarily stopped that work. Consensus on a set of planned policies and measures to meet the 2030 target has not yet been reached; this is why a "with additional measures" scenario has not yet been calculated. The scenario is described in more detail in the latest report on Austria's GHG emission projections "GHG Projections and Assessment of Policies and Measures in Austria" from March 2017 (http://www.umweltbundesamt.at/fileadmin/site/publikationen/REP0610.pdf).

5.1.2 Projection results

- Total GHG emissions (excluding LULUCF) in the scenario "with measures": Decrease from 78.9 Mt CO_2 eq in 2015 to 75.4 Mt in 2020 and 69.8 in 2030 (-4 % and -12 % respectively);
- long-term decrease driven by energy industries, "other sectors" (1.A.4) and IPPU (decrease in the range from 3 to 2 Mt CO2 eq 2015–2030), decrease also in the transport sector (more than 1 Mt), relative decrease strongest in the waste sector (44 %);
- share of fuel combustion remains at a level of about two third in the longer term;
- CO_2 emissions per capita expected to decrease to 6.3 t in 2030 and total greenhouse gas emissions per capita to 7.4 t CO_2 eq.

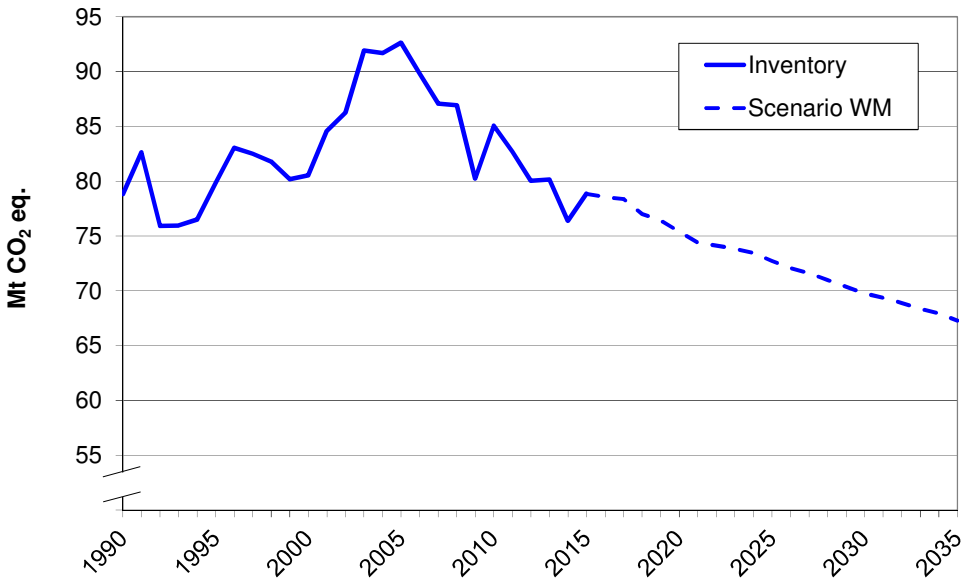

Figure 5.1: Actual and projected total GHG emissions (scenario WM) without LULUCF

Table 5.1: Actual and projected GHG emissions (scenario WM) by sector and by gas (in Mt)[1]:

	GHG emissions and removals (kt CO_2 eq)						GHG emission projections (kt CO_2 eq)			
	1990	1995	2000	2005	2010	2015	2020	2025	2030	2035
Sector										
1.A.1 Energy industries	13,838	12,965	12,314	16,240	13,988	10,928	8,943	8,335	8,081	7,597
1.A.2 Manuf.. Industries	9,889	10,336	10,081	11,795	11,543	10,467	10,677	10,844	10,934	11,070
1.A.3 Transport	13,976	15,887	18,818	24,934	22,529	22,587	22,708	22,461	21,466	20,228
1.A.4 Other sectors	14,586	14,835	13,671	13,639	11,251	8,842	8,387	7,294	6,332	5,463
2. IPPU	13,663	13,606	14,642	15,612	15,926	16,676	15,512	14,947	14,308	14,267
3. Agriculture	8,189	8,038	7,506	7,104	7,094	7,168	7,342	7,347	7,357	7,538
4. LULUCF	-12,139	-13,405	-16,227	-10,733	-5,887	-4,824	-7,747	-8,101	-4,608	-4,905
5. Waste	3,925	3,651	2,963	2,791	2,158	1,656	1,312	1,083	930	833
1.A.5, 1.B	738	497	538	527	569	527	513	414	358	278
MEMO Intl. Bunkers	*950*	*1,410*	*1,793*	*2,069*	*2,148*	*2,207*	*2,162*	*2,207*	*2,328*	*2,463*
Gas										
CO_2 including LULUCF	49,986	50,633	49,961	68,483	66,505	61,744	55,697	53,493	54,825	52,151
CO_2 excluding LULUCF	62,293	64,207	66,346	79,369	72,547	66,724	63,562	61,702	59,525	57,136
CH_4 including LULUCF	10,538	9,663	8,471	7,832	7,235	6,599	6,336	6,088	5,944	5,966
CH_4 excluding LULUCF	10,514	9,640	8,447	7,808	7,211	6,575	6,312	6,064	5,920	5,942
N_2O including LULUCF	4,485	4,570	4,488	3,763	3,531	3,650	3,638	3,574	3,509	3,501
N_2O excluding LULUCF	4,342	4,425	4,354	3,633	3,399	3,517	3,544	3,490	3,440	3,445
HFCs	2	353	714	1,146	1,483	1,662	1,442	1,127	659	490
PFCs	1,183	83	88	163	78	50	34	21	21	21
SF_6	471	1,100	575	494	336	309	476	288	159	188
NF_3	NO,NA	6	11	28	4	13	23	32	42	52
Total with LULUCF	66,666	66,410	64,307	81,909	79,172	74,027	67,646	64,623	65,159	62,369
Total without LULUCF	78,805	79,815	80,534	92,642	85,059	78,851	75,393	72,724	69,767	67,274

[1] N.B.: LULUCF and NF_3 shown for comparability with the inventory, but not included in the EU's QEWERT.

Trend by gas:

- In 2030 the share of CO_2 and CH_4 in total emissions is still 85 % and 8 % respectively, insignificant change of the share of N_2O (increase) and F-gases (decrease);
- CO_2 emissions trend due to decrease in fuel combustion as well as in industrial processes;
- CH_4 emission decrease since 1990 continues due to further decrease in the waste sector;
- no significant change is expected for N_2O emissions;
- F-gas emissions are expected to decrease by more than half, mainly because of legal restrictions for HFCs (e. g. quota system on EU level).

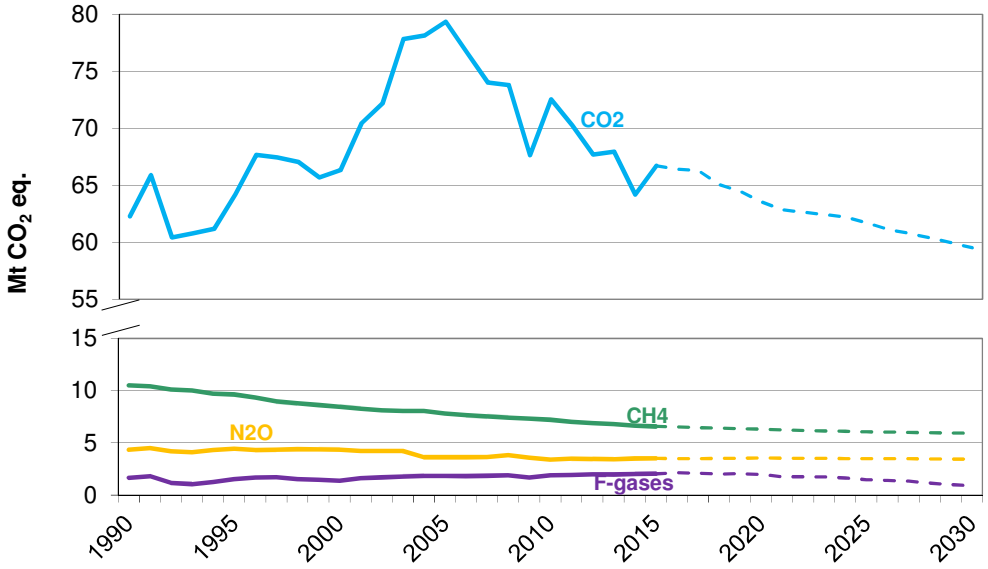

Figure 5.2: Actual and projected GHG emissions (scenario WM, excluding LULUCF) by gases

Trend by sector:

- Sectoral shares change by about 2–3 percentage points for most sectors from 2015 to 2030, therefore transport sector still dominates total emissions (31 %), followed by IPPU (21 %), manufacturing industries and construction (16 %), energy industries (12 %), agriculture 11 % and "other sectors" (CRF 1.A.4) 9 %,.;
- despite increasing electricity demand, emissions from energy industries are expected to decrease further (-26 % from 2015 to 2030) due to a further shift from solid and liquid fossil fuels to biomass, increasing contribution of hydro, solar and wind power;
- emission increase in several branches of manufacturing industries and construction due to the expected economic development (production increases), for the sector an increase of +4 % is projected;
- decrease of transport emissions (-5 %) by 2030 due to further increase in the use of biofuels, better efficiency standards and more electric mobility; the share of emissions caused by fuel exported in the vehicle tank is expected to remain constant at 25 %;
- a further decrease of emissions from "other sectors" (CRF 1.A.4, -26 %) is expected, mainly because of further improvement of energy efficiency of the building stock and

heating systems, shift from fossil fuels to biomass and ambient heat (including heat pumps);

- in contrast to the past trend, emissions from industrial processes and product use are expected to decrease until 2030 (-14 %), mainly due to decreasing emissions from metal production (because of import of direct reduced iron from 2016 onwards); decreasing emissions of F-gases (see above) contribute to the trend;
- emission increase in the sector agriculture (+3%) is mainly due to an expected increase of livestock (dairy cattle and pigs), which cannot be sufficiently compensated by the mitigation measures;
- further downward trend of emissions from the waste sector (-44%), mainly because of the decreasing carbon content of historically landfilled waste.
- LULUCF sector is projected to remain a net sink in the period until 2035; 2015–2020 increase of net removals due to an increase of the HWP sink, 2025–2030 decrease of net sink due to a similar trend in the dominating HWP pool and by an increased use of forest biomass; after 2030 the aggregated net sink of the two largest LULUCF sectors, 4.A Forest land and 4.G HWPs, is projected to remain stable.

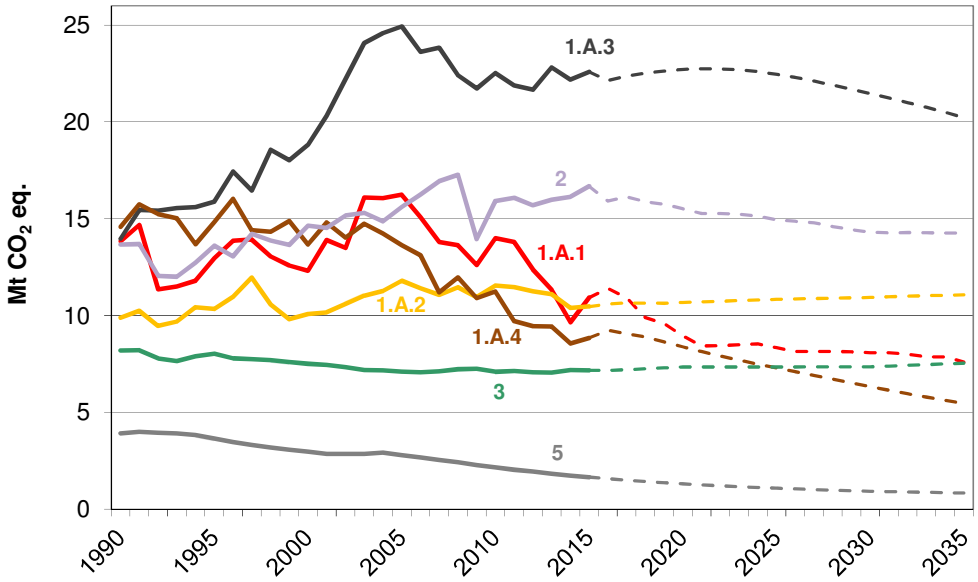

Figure 5.3: Actual and projected GHG emissions (scenario WM) by sectors

Sectoral activity data and parameters are listed in Annex C.

5.2 Methodology

5.2.1 Models

Emission projections for CO_2, CH_4, N_2O and F-gases are generally calculated by the Environment Agency Austria (Umweltbundesamt). Basically, the same methodologies as for the national GHG inventory are applied, as reported in Austria´s National Inventory Reports. The projections are consistent with the historical emission data of the Austrian Emission Inventory submission April 2017, with emission data up to the data year 2015.

The underlying sectoral forecasts of activities are based on the use of several models and methods and have been carried out in close collaboration with several institutions:

- The energy forecast is based on the National Energy Balance of Statistics Austria and on the econometric input-output model DYNK of the Austrian Institute of Economic Research, supported by calculations based on bottom-up models:
    - Austrian Energy Agency with the model TIMES for public electric power and district heating supply,
    - Energy Economics Group of the Technical University Vienna with INVERT/EE-Lab, for domestic heating (including district heating demand) and hot water supply,
    - Technical University of Graz with the models NEMO, which was developed for the calculation of emission inventories for road transport in larger areas, and GEORG, a fleet based model for the calculation of energy consumption and emissions of mobile off-road sources.
- The forecast of emissions from industrial processes and solvents are based on expert judgements of Umweltbundesamt.
- The estimations of emissions for fluorinated gases are based on a study published in 2010, supplemented by assumptions on the latest EU legislation .
- The agricultural forecast is based on the PASMA model of the Austrian Institute of Economical Research.
- The waste forecast is generally based on Umweltbundesamt expert judgements on waste amount and waste treatment.
- Several models have been used for the different LULUCF subsectors:
    - For forest growth the model CALDIS was used, for soil organic carbon the YASSO 07 model;
    - for cropland and grassland the PASMA model model of the Austrian Institute of Economical Research;
    - expert judgements have been used for wetlands, settlements and other land;
    - the forest sector model FOHOW2 has been used for projections of harvested wood products.

The models are described in more detail in Annex C. Details on models, emissions factors used and underlying parameters can be found in Chapter 3 of the (above mentioned) report on Austria's GHG emission projections "GHG Projections and Assessment of Policies and Measures in Austria" from March 2017 (see link at the beginning of this chapter).

The econometric model DYNK is a further development of the previously used DEIO model. It has been improved with respect to modelling of the energy consumption of households and the representation of the physical flows of the energy balance, the latter improving the link to the bottom-up models.

Main strength of the modelling approach is the set of bottom-up models which provide a very detailed description of the Austrian situation and its combination with an economic top-down model. As a weakness can be seen that this approach needs considerable resources (time, staff and budget) for a single scenario run.

The data structure of activities, input data, emission factors and emission calculations is based on SNAP categories (Selected Nomenclature for sources of Air Pollution). The structure of output data is presented and aggregated in the Common Reporting Format (CRF) of the UNFCCC. Sectoral definitions align fully with the IPCC.

5.2.2 Key Input Parameters

A summary of key input parameters used is given in Table 5.2.

Table 5.2: Key input parameter of emission projections.

Key underlying assumptions		*Historical*					*Projected*			
Assumption	*Unit*	*1995*	2000	2005	2010	2015	2020	2025	2030	2035
GDP growth rate	%		3.4	2.2	1.8	1.1	1.6	1.6	1.5	1.6
Population	thousands	7,948	8,012	8,225	8,361	8,630	8,939	9,156	9,314	9,432
No. of households	thousands	3,093	3,237	3,475	3,624	3,817	3,989	4,124	4,226	4,314
Heating degree days		3,186	2,884	3,341	3,365	2,858	3,204	3,171	3,118	3,065
Exchange rate USD	USD/EUR				1.33	1.12	1.16	1.20	1.20	1.20
International oil price	USD/bbl.*					55.00	89.00	105.00	115.00	120.00
International coal price	USD/t*					57.00	74.00	92.00	110.00	117.00
International gas price	USD/GJ*					6.20	7.70	8.30	9.00	9.60
CO_2 certificate price	EUR/t CO_2					7.50	15.00	20.00	26.50	36.50
	* 2015 prices									

5.2.3 Differences to Previous Scenarios

Compared to data reported in the Second Biennial Report, the historic time series as well as the new WM scenario show lower total emissions for all years:

- Inventory revisions are in the range of -0.1 to -0.3 Mt CO_2 eq,
- for 2015 the latest inventory shows 0.9 Mt lower emissions than the previous projections,
- the difference between previous and current projections is -3.6 Mt for 2020 and -6.2 Mt for 2030.

Differences exist for all sectors, apart from LULUCF the highest are found in sectors 1.A.2 & 2 (from -1.6 Mt in 2020 to 3.7 Mt in 2030), followed by 1.A.3, 1.A.4 and 1.A.1.

Changes with respect to the previous GHG emission projections are influenced by four main factors:

- Changes in the base data (e.g. GHG inventory, energy balance);
- Changes in assumptions for activity scenarios, e.g. due to revised economic scenarios (lower growth rates for some relevant industrial branches), additional policies considered (implementation of the Energy Efficiency Act) or revisions of policies (F-gas regulations);
- updates of emission factors;

- changes in the models used for activity or emission scenario, i. e. a new economic model as well as a complete revision of scenario and underlying models for the LULUCF sector.

Details can be found in Chapter 5 of the above mentioned report on Austria's GHG emission projections.

5.2.4 Sensitivity Analysis

The sensitivity analysis regarding the energy sector was based on the influence of economic growth on GHG emissions from transport, energy industries and manufacturing industries and construction, as well as the influence of changes in fuel prices and subsidies on GHG emissions in the residential and commercial sector. All these assessments are based on model results, obtained by calculating the effects on the Energy sector.

It is necessary to mention that the emission results in general are not linearly dependent on changes of an input factor. This is the reason why the presented sensitivity data cannot be seen as a functional dependency with varied parameters. The emission effect can only be seen for the specific values of the given parameters.

Two complete scenarios with different assumptions on economic growth and energy prices were calculated, based on the WM scenario. Main difference was a higher average economic growth of 2.5 % per year in the "Sensitivity 1" scenario and a lower growth of 0.8 % per year in the "Sensitivity 2" scenario. Energy prices as well as certificate prices in the EU ETS are influenced by economic growth (at EU and global level), the price assumptions for the sensitivity scenarios are shown in Table 5.3.

Table 5.3: Changes of parameters for sensitivity scenarios compared to the WM scenario

Sensitivity 1	2020	2030
International oil price	+6%	+28%
International coal price	+3%	+13%
International gas price	+4%	+33%
CO_2 certificate price	+33%	+17%
Sensitivity 2		
International oil price	-2%	-8%
International coal price	+0%	-5%
International gas price	+4%	-11%
CO_2 certificate price	-13%	-25%

The model calculations show 9 % higher total emissions for "Sensitivity 1" compared to the "With Measures" scenario and 4 % lower emissions for "Sensitivity 2" in 2030, see Table 5.4. Sector 1.A.1 shows the highest dependency on GDP growth, as the model projects that increased electricity demand can be met by domestic production in existing power plants under these more favourable economic circumstances (prices).

Table 5.4: Results of the sensitivity analysis – emission change compared to WM

Sensitivity 1	2020	2030
1.A.1 Energy industries	+1%	+49%
1.A.2 Manuf.. Industries	+3%	+5%
1.A.3 Transport	+3%	+6%
1.A.4 Other sectors	+0%	+0%
2 IPPU	+2%	+4%
Total (without LULUCF)	+2%	+9%
Sensitivity 2		
1.A.1 Energy industries	-10%	-1%
1.A.2 Manuf.. Industries	-3%	-7%
1.A.3 Transport	-3%	-6%
1.A.4 Other sectors	0%	2%
2 IPPU	-2%	-4%
Total (without LULUCF)	-3%	-4%

5.3 Assessment for Aggregate Effects of Policies and Measures

Chapter 4 shows a comprehensive listing of policies. Implemented and adopted policies and measures represent an important part of Austria's strategy to mitigate GHG emissions. It has to be mentioned, however, that the highly fragmented responsibilities for climate change mitigation among the Federation, '*Länder*' and Municipalities still cause difficulties for coherent monitoring and evaluation of the effects of policies and measures.

A "without measures" scenario has not been calculated for Austria with the models used for the "with measures" scenario. Various measures for the mitigation of GHG emissions are in place for a long time – it would be difficult to examine the emission path that would have evolved without any measures, it would cause considerable costs and would not provide reasonable value for policy making. An indicator based approach was therefore chosen to monitor and evaluate progress with policies and measures and to calculate an approximate estimate of the aggregate effect of policies and measures.

Indicator based approach:

- Assumptions: No effect of policies and measures before 1995, without policies and measures the GHG intensity would have remained constant since 1995 and emissions would follow the development of activities only;
- indicators are calculated as mean of the years 1990–1995 on subsectoral basis;
- indicators are used to calculate GHG emissions for 2015 and projection years by multiplying with the respective projected activity;
- aggregate effect derived by subtraction of emissions from the 'with measures' scenario from the indicator based emissions.

Indicators:

- 1.A.1: specific CO_2 emissions of the total output of the public power sector (power and CHP plants);
- 1.A.2 & 2: CO_2 intensity of steel production, CO_2 intensity of the gross value added for the rest of industry;

- 1.A.3: CO_2 intensity of driven passenger car kilometers and of ton kilometers for freight transport;
- 1.A.4: CO_2 intensity of households (stock of permanently occupied dwellings), CO_2 intensity of the gross value added of the service sector;
- CRF 2: N_2O intensity of chemical industry;
- CRF 3: CH_4 intensity of milk production, N_2O emissions from mineral fertilizers per unit arable land;
- CRF 5: CH_4 generated by municipal waste (growth of municipal waste is assumed to be equal to population growth).

For fluorinated gases emissions policies have come into effect in 2003. Emissions without measures have been extrapolated from the period 1990–2002 to later years (without sector 2.C, as not covered by policies). The aggregate effect of policies was calculated by subtracting emissions from the 'with measures' scenario from extrapolated emissions.

The calculated effects of policies and measures are summarized in Table 5.5.

Table 5.5: Aggregate effect of implemented and adopted policies and measures by gas (indicator based approach)

	2015	2020	2025	2030
CO_2	28.8	30.4	35.9	41.9
CH_4	3.3	3.8	4.3	4.6
N_2O	0.9	1.0	1.1	1.3
F-gases	0.6	1.0	1.9	2.9
Total	**33.5**	**36.3**	**43.2**	**50.7**

These numbers may include effects that are not directly attributable to policies and measures. There are effects which may have contributed to the decrease of the GHG intensity of activities (e.g. autonomous efficiency improvement of motor vehicles and heating systems), whereas some effects might have contributed to an increase (e.g. trend to bigger cars and more engine power as well as to larger dwellings and higher room temperature, due to increasing prosperity and decreasing service price). Assuming that autonomous efficiency improvements have a stronger impact than effects that lead to an emission increase, the estimates should be seen as an upper limit on the total effect of implemented policies and measures. Nevertheless, they give a proxy on how emissions would have grown from 1995 onwards without the implemented measures and other incentives for GHG emission reductions.

5.4 Information according to Art. 7.2 of the Kyoto Protocol

This section describes the information as required according to Art. 7.2 of the Protocol, as laid down in Decision 15/CMP.1[2], with respect to supplementarity relating to mechanisms under Article 6, 12 and 17 of the Kyoto Protocol.

[2] Guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol, II. Reporting of supplementary information under Article 7, paragraph 2

The Doha Amendment of the Kyoto Protocol with its obligations for the Second Commitment Period has not yet entered into force.

Austria intends to ratify the Amendment together with the other Member States of the European Union, who have agreed to fulfil their commitments under the Kyoto Protocol jointly according to Art. 4 of the Protocol. Austria intends to reach its mitigation target under the EU internal effort sharing by domestic measures alone and without the use of the mechanisms under the Kyoto Protocol.

Chapter 6

Vulnerability Assessment, Climate Change Impacts and Adaptation Measures

6.1 Expected Impacts of Climate Change

Temperature in Austria has risen by nearly 2°C since 1880, more than double as much as the global increase of 0.85°C. The increase was strongest in the period after 1980, when an increase by 1°C has been observed. Annual sunshine duration has increased by about 20%. All observed glaciers in Austria have clearly shown a reduction in surface area and in volume in the period since 1980. Duration of snow cover has been reduced in recent decades, especially in altitudes around 1,000 m above sea level. Precipitation change shows regional differences during the past 150 years: An increase by around 10–15 % has been observed in western Austria, a decrease of a comparable proportion in the south-east.

Results of scientific research on climate change with relevance for Austria have been compiled in the "Austrian Assessment Report Climate Change 2014", which has been developed according to the model of the IPCC Assessment Reports. It deals with the physical science basis as well as with consequences for society and nature and with mitigation and adaptation. A summary for policy makers as well as a synthesis report are available in English language (http://hw.oeaw.ac.at/Autorenbuch_engl.pdf). Examples of the results with respect to future climate change impacts are shown below.

Expected future climate change, based on the SRES A1B emissions scenario (i. e. medium to large increase in GHG concentrations):

- Anticipated medium temperature increase in the Alpine region compared to 1961–1990 is 1.6°C for 2021–2050 and 3.7 °C for 2071–2100;
- precipitation increase compared to 1970–2000 in winter (10 %) and decrease in summer (20 % and more) by the end of the 21st century, with more dry conditions in the southeast;
- moisture decrease in summer (5 %) by the end of the 21st century;
- global radiation decrease in winter and increase in summer (5–10 %) by the end of the 21st century;
- temperature extremes will significantly increase in the 21st century, e.g. hot nights in Vienna are expected to triplicate, whereas the number of days with frost shows a comparable decrease by the end of the century;
- frequency of heat waves will increase from around 5 to 15 per year by the end of the century;

Impacts hydrology:

- Seasonal shifts in runoff (decrease in summer, increase in winter, more decrease in the south);

- heavy and extreme precipitation events are likely to increase from autumn to spring, the risk of extreme floods is likely to be increased by a warming Mediterranean Sea.
- increasing temperature of lakes (+ 1–2.6°C) and rivers (+1°C) in summer by middle of the century;
- increasing evaporation especially in the second half of the century and in southern regions;
- reduced snow cover in low and medium altitude (e. g. -30 days snow cover duration at 1000–2000m altitude, more pronounced in southern regions) by middle of the century;
- glaciers will continue to shrink, by 2030 ice volume and glacier area are expected to have declined to half of the mean values of the period 1985–2004;

Impacts soil:

- decreasing soil moisture especially in the second half of the century and in southern regions;
- Enhanced susceptibility to landslides and debris flow due to increasing heavy precipitation and increased warm periods during snow;
- Retreat of the permafrost line, large areas of current permafrost would become free of permafrost;
- Increased rockfall and debris flow in high altitude areas influenced by permafrost.

Impacts on the living environment:

- Changes in ecosystem composition, migration of species (with a loss of species adapted to cold conditions);
- loss of native fish species due to increasing water temperatures;
- increasing productivity of mountain forests and agriculture in regions with sufficient precipitation, decreasing productivity at low altitudes in case of increasing dry periods;
- shift of coniferous forests to deciduous forests;
- regional shifts of conditions relevant for agriculture, crops and grassland, e. g. expansion of areas suitable for wine cultivation, increasing irrigation demand for fruit crops;

Impacts on Humans and society:

- Rising mortality due to increase in heat waves;
- negative impacts on health due to improved conditions for yet non-endemic infectual diseases and allergen plants;
- negative impacts on winter tourism due to decrease in snow cover and increasing costs for artificial snow-making;
- slight reduction in electricity production from hydropower due to reduced runoff;
- decreasing energy demand for space heating and increasing electricity demand for cooling;
- potential increase of extreme events which may affect infrastructure and buildings.

6.2 Vulnerability Assessment

The Austrian Strategy for Adaption to Climate Change contains a qualitative vulnerability analysis, differentiated according to the areas of action. The analysis builds mainly on the expected temperature- and precipitation-induced effects, some examples of the effects and resulting vulnerability assessments are listed below.

A**griculture and forestry** are strongly dependent on meteorological and climatic factors and are assessed as sectors with high vulnerability. There is considerable regional variability of vulnerability. Heat stress, reduced water supply due to changing precipitation patterns, new invasive species and pathogens may affect crop production and grassland as well as animal husbandry. Comparable risks exist for forestry, where changes may be faster than the life-cycle of trees and common tree species may not be fit for changed circumstances. Forest fires due to longer periods with reduced precipitation have to be seen as additional risk in this sector.

Vulnerability with respect to **water resources and water management** exhibits strong regional variability. Increase in precipitation and runoff in winter and decrease in summer is expected for some regions and may have impacts on shipping, quality of water bodies and aquatic biocenoses, the latter also being affected by increasing water temperature. In southern and eastern Austria, a decrease in groundwater recharge is likely. On a small scale, existing bottlenecks in water supply in areas with unfavourable water resources could worsen. Seasonal changes of precipitation patterns and earlier melting of snow may shift the risk of flooding into spring and winter in northern Austria, but there is high uncertainty regarding this topic.

Tourism is assessed to have high to low vulnerability. Depending on the region, winter snow cover may be considerably reduced, resulting in considerable losses in winter tourism. Low vulnerability is assumed for summer tourism as well as city tourism and health and spa tourism, which may benefit from increasing air and water temperatures, less rainfall in summer and an extended summer season on the one hand but which bear risks from worsening water quality of warmer lakes, heat waves in cities and lower diversity in the natural scenery (biodiversity, glacier retreat) on the other hand.

In the **energy** sector vulnerability is expected to be low for space heating because of decreasing energy demand of buildings and decreasing heating degree days. High vulnerability is expected for cooling of buildings, as cooling degree days will increase and periods of high electricity demand for cooling may coincide with unfavourable conditions for electricity production. Electricity production by thermal power plants are assessed as vulnerable, because increasing temperatures of ambient air and cooling water deteriorate efficiency and availability of thermal plants. Run-of-river power plants may be affected by seasonal changes in runoff, but current data does not allow for a reliable estimate of vulnerability. Supply of renewable energy sources is heavily influenced by climatic conditions; especially production of forest biomass is expected to be highly vulnerable in some regions.

In **construction and housing**, existing buildings are – regionally different – highly vulnerable to e. g. heat waves in urban areas, to more frequent events of heavy rain, to increased snow

loads, to increasing frequency of local-scale floods as well as avalanches and landslides. Some of these risks may be minimised by renovation measures and most risks may be avoided for the construction of new buildings.

Different grades of vulnerability can be found concerning **human health**. Vulnerability to heat stress is high for children, elder people and people with heart diseases and lower for the rest of the population. Vulnerability to increasing levels of ground-level ozone and increasing UV-radiation is high for sensible parts of the population but moderate for the general population. Changed climatic conditions may be favourable for the spread of pathogens, vectors and allergic plants, which poses a risk for population in general.

Ecosystems and biodiversity are assessed to by highly vulnerable to the expected changes, like increasing temperature and changed precipitation patterns. Especially regions with a high share of endemic species like alpine regions must be seen as highly vulnerable. Changes in species composition, spread of alien species and loss of habitats and species must be expected.

Vulnerability is expected to be high for **transportation infrastructure** in some regions. Increase in the amount of snow at elevations above 1800 m, potentially accompanied by a higher risk of avalanches in certain regions, and thawing of permafrost, resulting in rock-fall and land-slides, may affect infrastructure in higher regions. Heavy precipitation on local level can result in drainage system overloads and the flooding of underpasses as well as in increasing risk of landslides and mud flows; erosion and washouts can threaten the stability of railroad embankments and road beds. Increased heat stress can result in damage to materials and structures, as well as the deformation of pavement and rail infrastructure.

For **industry and trade** vulnerability in general is assessed to be moderate. Higher temperatures and heat waves increase the cooling requirements for the storage and transport of various products and affect working conditions. Decrease in the availability of cooling water can affect cooling-intensive production as well as power generation. Potential changes in the availability of raw materials and intermediate products due to changes in temperature and precipitation conditions can have an impact on the entire value chain. Through globalisation, both the supply for production in Austria and the sales of Austrian products will be influenced by climate effects in other regions of the world.

Current climate scenarios do not allow for an assessment of the future trend for extreme events, like storms and hail, floodings and landslides. Most of the sectors mentioned above, however, would exhibit considerable vulnerability to an increase of the frequency and intensity of extreme events.

More details on the vulnerability assessment can be found in Part 2 of the Austrian Adaptation Strategy[1].

[1] https://www.bmnt.gv.at/dam/jcr:9f582bfd-77cb-4729-8cad-dd38309c1e93/NAS_Aktionsplan_MR_Fassung_final_18112017%5B1%5D.pdf (in German language)

6.3 Adaptation Measures

6.3.1 Status Quo

Already in 2007, the Ministry of Agriculture, Forestry, Environment and Water Management has put adaptation to climate change on its agenda. As an alpine country, Austria is used to adapt to environmental risks since centuries and this management of risks has proved very helpful for adapting to climate change.

The Austrian adaptation policy approach aims to reduce negative impacts and build resilience to climate change. It intends to create a national framework to ensure coordination and harmonisation of the various climate change adaptation activities in all areas. The national adaptation strategy (NAS) with an integrated adaptation plan (NAP) was adopted first on 23 October 2012 by the Council of Ministers and endorsed by the Provincial Governors' Conference on 16 May 2013. In August 2017, a revised version of the NAS and the NAP was adopted by the Austrian Council of Ministers[2]. The revised NAS and NAP was also and endorsed by the Provincial Governors' Conference in November 2017. An overview of the development process of the strategy, starting in 2008, based on recommendations from the scientific community and accompanied by a participatory process, can be found in Section 6.3.2 of Austria's Sixth National Communication

These policy documents are based on latest scientific knowledge available for the Austrian context. Many of these scientific projects are financed by the Austrian Climate Research Programme (ACRP) of the Climate and Energy Fund and StartClim, two important research programs providing more than 5 Mio Euro of funding each year.

At the sub-national level (*Länder*), climate coordination officers who were installed in all nine provincial governments acting as the main agents of vertical as well as horizontal coordination of mitigation policy have put adaptation on their agenda too. A variety of initiatives have already been enacted in the *Länder*, ranging from research projects to concrete measures in individual sectors. In addition, they have either developed regional adaptation strategies (Oberösterreich 2013, Steiermark 2015, Vorarlberg 2016, Salzburg 2017), integrated adaptation and mitigation strategies (Tirol 2015), or they have integrated adaptation into existing climate mitigation strategies (Niederösterreich 2017, Wien 2009). Kärnten is in the process of preparing a climate adaptation strategy. In Burgenland, adaptation measures are directly integrated into sectoral programmes and strategies.

As climate change impacts are mostly visible at the local and regional level, the KLAR! – Climate Change Adaptation Model Regions Programme – has been launched in 2016 to provide support for Austrian regions in adapting to climate change. Henceforward, 23 participating model regions from all over the country have been selected to prepare their adaptation strategies by the end of 2017. Between 2018 and 2020, selected KLAR!-regions will receive financial support for the implementation of the selected adaptation measures on local and regional scale. The KLAR!-programme has been initiated by the Austrian Ministry of

[2] https://www.bmnt.gv.at/umwelt/klimaschutz/klimapolitik_national/anpassungsstrategie/strategie-kontext.html (in German language)

Agriculture, Forestry, Environment, and Water Management and the Climate and Energy Fund.

6.3.2 Recommendations for Action

The Austrian adaptation policy consists of two parts: a National Adaptation Strategy (NAS) and an Action Plan (NAP). While the NAS focuses on the strategic components of adaptation (i.e. setting the scene for adaptation, policy developments on various levels, research activities, social aspects of adaptation, etc.), the NAP presents a catalogue of 136 adaptation options for 14 areas.

The adaptation recommendations are presented based on a qualitative vulnerability assessment for the following sectors:

- Agriculture
- Forestry
- Water Resources and Water Management
- Tourism
- Energy – Focus on the Electricity Industry
- Construction and Housing
- Protection from Natural Hazards
- Disaster Risk Management
- Health
- Ecosystems/Biodiversity
- Transportation Infrastructure and Selected Aspects of Mobility
- Spatial Planning
- Business/Industry/Trade
- Cities – Urban Green and Open Spaces.

As an example, one adaptation recommendation in the sector forestry aims to develop precautionary measures and pre-warning systems in case of forest fires which are expected to increase due to climate change. In case of tourism, one recommendation focuses on the highly vulnerable winter tourism, aiming to help tourism regions and operators in developing snow-independent offers. An overview can be found in Chapter 15 of the National Adaptation Strategy.

6.3.3 Implementation of the Strategy

Implementation of the National Adaptation Strategy has to be done in close cooperation of Federation, *Länder* and local authorities. The implementation of the recommendations will have to be achieved within the existing jurisdictions of all governmental authorities. Under the current circumstances implementation of the recommendations has to be covered by the resources available in the applicable financial frameworks of the public sector. Integration of adaptation principles into existing instruments and structures of the policy making and administration is an on-going process.

Austria is one among a few European countries which has started to work on monitoring and evaluation of the NAS/NAP. In Austria, a two-pronged approach has been taken: i) A participatory approach consisting of a self-assessment by relevant stakeholders from the different levels that are active in the implementation of the NAP, and ii) a data based approach focusing on a criteria catalogue (kind of indicators) helping to put some light on selected aspects relevant for adaptation. The joint consideration of these two components provide a broad picture of the state of implementation of adaptation as well as key trends and progress in Austria. A progress report[3] was published by the BMLFUW in 2015 to present the state of implementation of the NAS and NAP. The next progress report will be due in 2020.

To support the implementation of adaptation measures, an economic evaluation of the consequences of climate change impacts and the costs of inaction has been prepared. The study[4] demonstrates that climate related damage costs will increase by a multiple by 2050 compared to today and reach at least an average annual level of € 3.8 to € 8.8 billion. These results clearly show that the long-term planning and consequent implementation of adaptation measures is crucial.

The Austrian adaptation strategy (with integrated action plan) is seen as the first political milestone in addressing the consequences of climate change. It will be further developed (as a kind of "living document") to reflect the growth in knowledge and factual needs.

Austria will gradually have to adapt to climate change and adaptation measures will have to be implemented without any delay. The present adaptation strategy provides an appropriate framework for this process. One of the main messages of the NAS can be described as follows: It is essential that the potential consequences of climate change are taken into account in all relevant future planning and decision-making processes from the local level to the national level, by the authorities, in the private sector, and by individuals.

[3] https://www.bmlfuw.gv.at/dam/jcr:affd5225-8d2b-4772-9977-da229f5b5690/Fortschrittsbericht-Final_v17_2015-12-02_klein.pdf

[4] https://www.klimafonds.gv.at/assets/Uploads/Projektberichte/ACRP-2012/20150707COINEBKarl-SteiningerACRP5B286216KR12AC5K01380.pdf

Chapter 7

Financial Resources and Transfer of Technology

The provision of financial, technological and capacity-building support to developing countries is a key element in tackling climate change at the global level.

Austria is firmly committed to providing such support in the larger context of meeting the ultimate objective of the Convention and the long-term goals of the Paris Agreement. In tables 7.1 to 7.5 we provide full details on our efforts from 2013 to 2016 (excluding mobilised private climate finance).

Public climate finance support by Austria to developing countries – including for technology transfer and capacity-building – has increased considerably since 1992. This development is in line with our commitment to provide "new and additional" resources, which we define as a gradual scaling up of support over the years since the Convention and its Kyoto Protocol entered into force, with new programmes, projects and focus areas supplementing and/or extending existing initiatives over time, with the overall volume of support provided increasing in the longer term.

We also strive to achieve in the longer term a balance between support for adaptation and mitigation in our bilateral cooperation, while noting that such a balance must be viewed in a comprehensive manner (both quantitatively and qualitatively, and acknowledging that projects often address both adaptation and mitigation elements) and also taking into account other priorities articulated by our partner countries.

Figure 1 below provides an overview of the last seven years (2010-2016) of climate finance provided by Austria to developing countries.

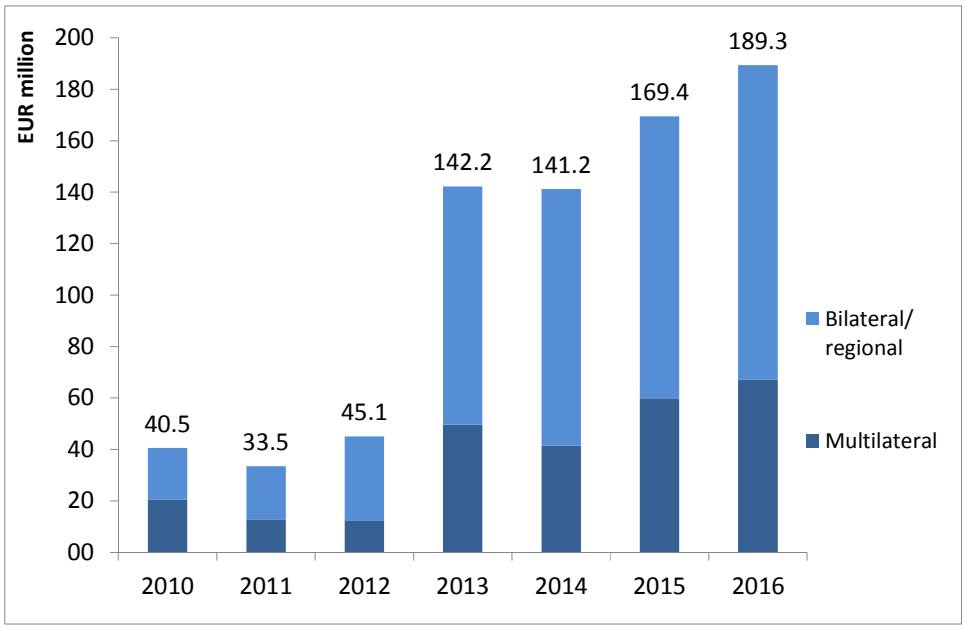

Figure 7.1: Austria's provision of climate finance to developing countries, 2010-2016

A broad range of actors and instruments contribute to Austria's overall contribution to climate finance. Key actors include the Development Bank of Austria (OeEB), the Federal Ministry of Finance (BMF), the Austrian Development Cooperation (ADC), and the Federal Ministry of Agriculture, Forestry, Environment and Water Management (BMLFUW).

7.1 Finance

7.1.1 National approach for tracking the provision of financial, technological and capacity-building support to developing countries

In 2013, Austria adopted an international climate finance strategy (KFS, available in German only[1]). KFS established a new inter-ministerial working group (AGIK) dedicated to climate finance. AGIK is tasked to regularly take stock of national and international developments related to the provision of financial, technological and capacity-building support to developing countries and to respond to emerging developments, including on tracking the provision of financial, technological and capacity-building support.

KFS also contains guidelines for tracking the provision of climate finance. These guidelines stipulate the use of OECD DAC methodologies to ensure consistency with Austria's ODA reporting as well as comparability with other climate finance providers. This specifically entails:

- Identification of eligible recipient countries using the most current DAC list of ODA recipients;
- Bottom-up identification of climate-relevant projects using DAC Rio markers for mitigation and adaptation, respectively; (for projects marked with a Rio marker value "1", amounts reported as climate finance are discounted by 50 percent);
- No double-counting of DAC Rio markers (if a project has more than one Rio marker valued at "1" or above, only one value (the higher value) is used for the amounts reported as climate finance);
- Identification of "climate-specific" contributions to multilateral organizations (MDBs) using the latest available DAC data on imputed multilateral shares[2];
- Use of official DAC EUR-USD exchange rates for a given reporting year;
- All flows reported on a commitment basis (starting in 2016).

Data collection for climate finance is jointly supervised by the Austrian Development Agency (ADA) and BMLFUW, with ADA compiling and storing information as well as ensuring quality control.

[1] https://www.bmlfuw.gv.at/umwelt/klimaschutz/internationales/int_klimafinanzierung/strategie_berichte.html
[2] The latest DAC data available during the finalisation of a BR is used; figures from previous BRs are not updated.

Standard contractual clauses for individual contracts require monitoring and reporting of project implementation by the implementing agencies, thus ensuring that funds deliver on the objectives defined for individual projects.

7.1.2 How the provision of financial, technological and capacity-building support is assisting developing countries

All bilateral programmes, projects and initiatives that Austria supports are developed and implemented in close cooperation with our partner countries. Many projects result from priorities identified in jointly developed country strategies, while others may respond to individual requests from government agencies in partner countries. We seek to ensure that all programmes, projects and initiatives are compatible with other related national development strategies of our partner countries. We therefore understand that all bilateral programmes, projects and initiatives meet existing and emerging needs and interests expressed by our partner countries at the national level and in the context of concrete policy implementation.

7.1.3 Mobilised private climate finance

In line with the commitment of developed countries of mobilizing jointly USD 100 billion dollars a year by 2020 from a wide variety of sources, Austria is committed to mobilise private climate finance and to extend tracking to cover mobilised private climate finance over time. We recognize that reporting under the BR is voluntary and that there is no CTF table to provide information in a common format.

Austria is currently tracking mobilised private climate finance through ADC business partnerships.[3] These partnerships allow for a co-financing of up to 50 percent of a given business investment by ADC, provided the overall project supports development objectives in line with priorities of our partner countries. We are closely following international developments on this issue, e.g. under the OECD Research Collaborative for Tracking Private Climate Finance and intend to expand the scope of reporting on this issue as further guidance is developed.

[3] http://www.entwicklung.at/fileadmin/user_upload/Dokumente/Unternehmen/Englisch/Guidelines_for_Business_Partnerships.pdf

Table 7.1a: Provision of public financial support: summary information in 2013

Allocation channels	*European euro - EUR*					*USD*[b]				
	Core/ general[c]	*Climate-specific*[d]				*Core/ general*[c]	*Climate-specific*[d]			
		Mitigation	*Adaptation*	*Cross-cutting*[e]	*Other*[f]		*Mitigation*	*Adaptation*	*Cross-cutting*[e]	*Other*[f]
Total contributions through multilateral channels:				49,686,466					65,967,161	
Multilateral climate change funds[g]				7,852,287					10,425,236	
Other multilateral climate change funds[h]										
Multilateral financial institutions, including regional development banks				40,689,074					54,021,607	
Specialized United Nations bodies				1,145,104					1,520,318	
Total contributions through bilateral, regional and other channels		76,700,000	3,115,000	12,690,000			101,832,183	4,135,688	16,848,115	
Total		76,700,000	3,115,000	62,376,466			101,832,183	4,135,688	82,815,276	

Table 7.1b: Provision of public financial support: summary information in 2014

Allocation channels	*European euro - EUR*					*USD*[b]				
	Core/ general[c]	*Climate-specific*[d]				*Core/ general*[c]	*Climate-specific*[d]			
		Mitigation	*Adaptation*	*Cross-cutting*[e]	*Other*[f]		*Mitigation*	*Adaptation*	*Cross-cutting*[e]	*Other*[f]
Total contributions through multilateral channels:				41,485,477					55,042,427	
Multilateral climate change funds[g]										
Other multilateral climate change funds[h]										
Multilateral financial institutions, including regional development banks				40,331,412					53,511,228	
Specialized United Nations bodies				1,154,065					1,531,200	
Total contributions through bilateral, regional and other channels		71,002,910	6,882,195	21,868,146			94,205,798	9,131,213	29,014,391	
Total		71,002,910	6,882,195	63,353,623			94,205,798	9,131,213	84,056,818	

Table 7.1c: Provision of public financial support: summary information in 2015

Allocation channels	*European euro - EUR*					*USD*[b]				
	Core/ general[c]	*Climate-specific*[d]				*Core/ general*[c]	*Climate-specific*[d]			
		Mitigation	*Adaptation*	*Cross-cutting*[e]	*Other*[f]		*Mitigation*	*Adaptation*	*Cross-cutting*[e]	*Other*[f]
Total contributions through multilateral channels:		1,176,755		58,627,580			1,303,162		64,925,338	
Multilateral climate change funds[g]				23,671,401					26,214,176	
Other multilateral climate change funds[h]										
Multilateral financial institutions, including regional development banks				34,736,237					38,467,593	
Specialized United Nations bodies		1,176,755		219,942			1,303,162		243,568	
Total contributions through bilateral, regional and other channels		97,987,199	7,119,240	4,507,804			108,512,955	7,883,987	4,992,030	
Total		99,163,954	7,119,240	63,135,384			109,816,117	7,883,987	69,917,368	

Table 7.1d: Provision of public financial support: summary information in 2016

Allocation channels	*European euro - EUR*					*USD*[b]				
	Core/ general[c]	*Climate-specific*[d]				*Core/ general*[c]	*Climate-specific*[d]			
		Mitigation	*Adaptation*	*Cross-cutting*[e]	*Other*[f]		*Mitigation*	*Adaptation*	*Cross-cutting*[e]	*Other*[f]
Total contributions through multilateral channels:		1,215,569		65,887,868			1,344,656		72,884,810	
Multilateral climate change funds[g]				20,435,701					22,605,864	
Other multilateral climate change funds[h]										
Multilateral financial institutions, including regional development banks				45,327,656					50,141,212	
Specialized United Nations bodies		1,215,569		124,511			1,344,656		137,734	
Total contributions through bilateral, regional and other channels		93,030,524	5,786,138	23,409,025			102,909,871	6,400,595	25,894,939	
Total		94,246,093	5,786,138	89,296,893			104,254,527	6,400,595	98,779,749	

Table 7.2a: Provision of public financial support: contribution through multilateral channels in 2013

Donor funding	*Total amount*				*Status*[b]	*Funding source*[f]	*Financial instrument*[f]	*Type of support*[f, g]	*Sector*[c]
	Core/general[d]		*Climate-specific*[e]						
	European euro - EUR	*USD*	*European euro - EUR*	*USD*					
Total contributions through multilateral channels			49,686,466	65,967,161					
Multilateral climate change funds [g]			7,852,287	10,425,236					
1. Global Environment Facility			5,853,614	7,771,660	Provided	ODA	Grant	Cross-cutting	
2. Least Developed Countries Fund			1,499,005	1,990,182	Provided	ODA	Grant	Cross-cutting	
3. Special Climate Change Fund									
4. Adaptation Fund			499,668	663,394	Provided	ODA	Grant	Cross-cutting	
5. Green Climate Fund									
6. UNFCCC Trust Fund for Supplement. Activities									
7. Other multilateral climate change funds									
Multilateral financial institutions, including regional development banks			40,689,074	54,021,607					
1. World Bank			26,118,641	34,676,900	Provided	ODA	Grant	Cross-cutting	
2. International Finance Corporation									
3. African Development Bank			12,571,760	16,691,131	Provided	ODA	Grant	Cross-cutting	
4. Asian Development Bank			1,998,673	2,653,576	Provided	ODA	Grant	Cross-cutting	
5. European Bank for Reconstr. and Devel.									
6. Inter-American Development Bank									
7. Other									
Specialized United Nations bodies			1,145,104	1,520,318					
1. United Nations Development Programme									
2. United Nations Environment Programme			1,073,325	1,425,020					
Montreal Protocol			1,073,325	1,425,020	Provided	ODA	Grant	Cross-cutting	
3. Other			71,779	95,298					
UNFCCC			71,779	95,298	Provided	ODA	Grant	Cross-cutting	

Table 7.2b: Provision of public financial support: contribution through multilateral channels in 2014

Donor funding	*Total amount*				*Status*[b]	*Funding source*[f]	*Financial instrument*[f]	*Type of support*[f, g]	*Sector*[c]
	Core/general[d]		*Climate-specific*[e]						
	European euro - EUR	*USD*	*European euro - EUR*	*USD*					
Total contributions through multilateral channels			41.485.477	55.042.427					
Multilateral climate change funds [g]									
1. Global Environment Facility									
2. Least Developed Countries Fund									
3. Special Climate Change Fund									
4. Adaptation Fund									
5. Green Climate Fund									
6. UNFCCC Trust Fund for Supplement. Activities									
7. Other multilateral climate change funds									
Multilateral financial institutions, including regional development banks			40.331.412	53.511.228					
1. World Bank			26.135.980	34.676.900	Provided	ODA	Grant	Cross-cutting	
2. International Finance Corporation									
3. African Development Bank			12.195.433	16.180.752	Provided	ODA	Grant	Cross-cutting	
4. Asian Development Bank									
5. European Bank for Reconstr. and Devel.									
6. Inter-American Development Bank									
7. Other									
Specialized United Nations bodies			1.154.065	1.531.200					
1. United Nations Development Programme									
2. United Nations Environment Programme			1.071.198	1.421.253					
Montreal Protocol			1.071.198	1.421.253	Provided	ODA	Grant	Cross-cutting	
3. Other			82.867	109.946					
UNFCCC			82.867	109.946	Provided	ODA	Grant	Cross-cutting	

Table 7.2c: Provision of public financial support: contribution through multilateral channels in 2015

Donor funding	*Total amount*				*Status*[b]	*Funding source*[f]	*Financial instrument*[f]	*Type of support*[f, g]	*Sector*[c]
	Core/general[d]		*Climate-specific*[e]						
	European euro - EUR	*USD*	*European euro - EUR*	*USD*					
Total contributions through multilateral channels			59,804,335	66,228,499					
Multilateral climate change funds [g]			23,671,401	26,214,176					
1. Global Environment Facility			17,671,401	19,569,658	committed	ODA	grant	cross-cutting	
2. Least Developed Countries Fund									
3. Special Climate Change Fund									
4. Adaptation Fund									
5. Green Climate Fund			6,000,000	6,644,518	committed	ODA	grant	cross-cutting	
6. UNFCCC Trust Fund for Supplement. Activities									
7. Other multilateral climate change funds									
Multilateral financial institutions, including regional development banks			34,736,237	38,467,593					
1. World Bank			24,870,499	27,542,080	committed	ODA	grant	cross-cutting	
2. International Finance Corporation									
3. African Development Bank			8,486,788	9,398,436	committed	ODA	grant	cross-cutting	
4. Asian Development Bank			1,339,210	1,483,068	committed	ODA	grant	cross-cutting	
5. European Bank for Reconstr. and Devel.									
6. Inter-American Development Bank			39,740	44,008	committed	ODA	grant	cross-cutting	
7. Other									
Specialized United Nations bodies			1,396,697	1,546,730					
1. United Nations Development Programme									
2. United Nations Environment Programme									
Montreal Protocol			1,176,755	1,303,162	committed	ODA	grant	mitigation	
3. Other									
UNFCCC			219,942	243,568	committed	ODA	grant	cross-cutting	

Table 7.2d: Provision of public financial support: contribution through multilateral channels in 2016

Donor funding	*Total amount*				*Status*[b]	*Funding source*[f]	*Financial instrument*[f]	*Type of support*[f, g]	*Sector*[c]
	Core/general[d]		*Climate-specific*[e]						
	European euro - EUR	*USD*	*European euro - EUR*	*USD*					
Total contributions through multilateral channels			67,103,437	74,229,466					
Multilateral climate change funds [g]			20,435,701	22,605,864					
1. Global Environment Facility			8,835,701	9,774,005	committed	ODA	grant	cross-cutting	
2. Least Developed Countries Fund									
3. Special Climate Change Fund									
4. Adaptation Fund									
5. Green Climate Fund			11,600,000	12,831,858	committed	ODA	grant	cross-cutting	
6. UNFCCC Trust Fund for Supplement. Activities									
7. Other multilateral climate change funds									
Multilateral financial institutions, including regional development banks			45,327,656	50,141,212					
1. World Bank			24,175,260	26,742,544	committed	ODA	grant	cross-cutting	
2. International Finance Corporation									
3. African Development Bank			8,538,304	9,445,026	committed	ODA	grant	cross-cutting	
4. Asian Development Bank			1,339,210	1,481,427	committed	ODA	grant	cross-cutting	
5. European Bank for Reconstr. and Development									
6. Inter-American Development Bank			39,964	44,207	committed	ODA	grant	cross-cutting	
7. Other									
International Fund for Agricultural Development			11,234,918	12,428,007	committed	ODA	grant	cross-cutting	
Specialized United Nations bodies			1,340,080	1,482,390					
1. United Nations Development Programme									
2. United Nations Environment Programme									
Montreal Protocol			1,215,569	1,344,656	committed	ODA	grant	mitigation	
3. Other									
UNFCCC, KP			124,511	137,734	committed	ODA	grant	cross-cutting	

Table 7.3a: Provision of public financial support: contribution through bilateral, regional and other channels in 2013

Recipient country/ region/project/programme	*Total amount*		*Status*	*Funding source*	*Financial instrument*	*Type of support*	*Sector*
	Climate-specific						
	European euro - EUR	*USD*					
998 (Developing countries, unspecified)	1,010,000	1,340,945	disbursed	20 (OOF)	000 (non-concessional development loan)	mitigation	430 Other multisector
610 (Armenia)	3,000,000	3,983,006	disbursed	20 (OOF)	000 (non-concessional development loan)	mitigation	230 ENERGY GENERATION AND SUPPLY
998 (Developing countries, unspecified)	11,000,000	14,604,355	disbursed	20 (OOF)	000 (non-concessional development loan)	mitigation	230 ENERGY GENERATION AND SUPPLY
389 (North & Central America, regional)	18,000,000	23,898,035	disbursed	20 (OOF)	000 (non-concessional development loan)	mitigation	230 ENERGY GENERATION AND SUPPLY
612 (Georgia)	1,300,000	1,725,969	disbursed	20 (OOF)	000 (non-concessional development loan)	mitigation	230 ENERGY GENERATION AND SUPPLY
351 (Honduras)	6,060,000	8,045,672	disbursed	20 (OOF)	000 (non-concessional development loan)	mitigation	230 ENERGY GENERATION AND SUPPLY
619 (Central Asia, regional)	6,000,000	7,966,012	disbursed	20 (OOF)	000 (non-concessional development loan)	mitigation	230 ENERGY GENERATION AND SUPPLY
57 (Kosovo)	500,000	663,834	disbursed	20 (OOF)	000 (non-concessional development loan)	mitigation	230 ENERGY GENERATION AND SUPPLY
238 (Ethiopia)	3,000,000	3,983,006	committed	10 (ODA)	110 (grant)	mitigation	430 Other multisector
285 (Uganda)	2,000,000	2,655,337	committed	10 (ODA)	110 (grant)	cross-cutting	140 WATER AND SANITATION
260 (Niger)	400,000	531,067	committed	10 (ODA)	110 (grant)	adaptation	720 Emergency Response
287 (Burkina Faso)	100,000	132,767	committed	10 (ODA)	110 (grant)	adaptation	720 Emergency Response
287 (Burkina Faso)	1,250,000	1,659,586	committed	10 (ODA)	110 (grant)	cross-cutting	311 AGRICULTURE
298 (Africa, regional)	750,000	995,751	committed	10 (ODA)	110 (grant)	adaptation	140 WATER AND SANITATION
298 (Africa, regional)	250,000	331,917	committed	10 (ODA)	110 (grant)	adaptation	152 Conflict prevention and resolution, peace and security
289a (West Africa, regional)	2,000,000	2,655,337	committed	10 (ODA)	110 (grant)	mitigation	230 ENERGY GENERATION AND SUPPLY
289a (West Africa, regional)	550,000	730,218	committed	10 (ODA)	110 (grant)	mitigation	230 ENERGY GENERATION AND SUPPLY
89 (Europe, regional)	220,000	292,087	committed	10 (ODA)	110 (grant)	adaptation	230 ENERGY GENERATION AND SUPPLY
142 (Egypt)	500,000	663,834	committed	10 (ODA)	110 (grant)	mitigation	N/A

610 (Armenia)	850,000	1,128,518	committed	10 (ODA)	110 (grant)	adaptation	311 AGRICULTURE
660 (Nepal)	50,000	66,383	committed	10 (ODA)	110 (grant)	adaptation	740 Disaster prevention and preparedness
665 (Pakistan)	65,000	86,298	committed	10 (ODA)	110 (grant)	adaptation	740 Disaster prevention and preparedness
289c (Southern Africa, regional)	300,000	398,301	committed	10 (ODA)	110 (grant)	mitigation	230 ENERGY GENERATION AND SUPPLY
289c (Southern Africa, regional)	2,000,000	2,655,337	committed	10 (ODA)	110 (grant)	mitigation	230 ENERGY GENERATION AND SUPPLY
289c (Southern Africa, regional)	1,800,000	2,389,804	committed	10 (ODA)	110 (grant)	mitigation	230 ENERGY GENERATION AND SUPPLY
679 (South Asia, regional)	900,000	1,194,902	committed	10 (ODA)	110 (grant)	cross-cutting	N/A
389 (North & Central America, regional)	100,000	132,767	committed	10 (ODA)	110 (grant)	adaptation	740 Disaster prevention and preparedness
289b (East Africa, regional)	1,000,000	1,327,669	committed	10 (ODA)	110 (grant)	mitigation	230 ENERGY GENERATION AND SUPPLY
619 (Central Asia, regional)	800,000	1,062,135	committed	10 (ODA)	110 (grant)	cross-cutting	N/A
289a (West Africa, regional)	600,000	796,601	committed	10 (ODA)	110 (grant)	mitigation	230 ENERGY GENERATION AND SUPPLY
298 (Africa, regional)	600,000	796,601	committed	10 (ODA)	110 (grant)	cross-cutting	N/A
630 (Bhutan)	140,000	185,874	committed	10 (ODA)	110 (grant)	mitigation	230 ENERGY GENERATION AND SUPPLY
619 (Central Asia, regional)	2,000,000	2,655,337	committed	10 (ODA)	110 (grant)	mitigation	N/A
619 (Central Asia, regional)	700,000	929,368	committed	10 (ODA)	110 (grant)	mitigation	N/A
619 (Central Asia, regional)	2,000,000	2,655,337	committed	10 (ODA)	110 (grant)	mitigation	N/A
619 (Central Asia, regional)	2,000,000	2,655,337	committed	10 (ODA)	110 (grant)	mitigation	N/A
998 (Developing countries, unspecified)	2,500,000	3,319,172	committed	10 (ODA)	110 (grant)	mitigation	N/A
998 (Developing countries, unspecified)	1,500,000	1,991,503	committed	10 (ODA)	110 (grant)	mitigation	N/A
498 (America, regional)	800,000	1,062,135	committed	10 (ODA)	110 (grant)	cross-cutting	N/A
89 (Europe, regional)	1,000,000	1,327,669	committed	10 (ODA)	110 (grant)	mitigation	N/A
998 (Developing countries, unspecified)	2,000,000	2,655,337	committed	10 (ODA)	110 (grant)	cross-cutting	140 WATER AND SANITATION
289 (South of Sahara, regional)	1,000,000	1,327,669	committed	10 (ODA)	110 (grant)	cross-cutting	N/A
498 (America, regional)	400,000	531,067	committed	10 (ODA)	110 (grant)	cross-cutting	N/A
798 (Asia, regional)	800,000	1,062,135	committed	10 (ODA)	110 (grant)	cross-cutting	N/A
289 (South of Sahara, regional)	2,000,000	2,655,337	committed	10 (ODA)	110 (grant)	mitigation	N/A
998 (Developing countries, unspecified)	220,000	292,087	committed	10 (ODA)	110 (grant)	mitigation	N/A
612 (Georgia)	450,000	597,451	committed	10 (ODA)	110 (grant)	mitigation	N/A
615 (Tajikistan)	570,000	756,771	committed	10 (ODA)	110 (grant)	mitigation	N/A
614 (Kyrgyz Rep.)	150,000	199,150	committed	10 (ODA)	110 (grant)	adaptation	N/A

289b (East Africa, regional)	150,000	199,150	committed	10 (ODA)	110 (grant)	adaptation	N/A
289 (South of Sahara, regional)	30,000	39,830	committed	10 (ODA)	110 (grant)	adaptation	N/A
238 (Ethiopia)	40,000	53,107	committed	10 (ODA)	110 (grant)	cross-cutting	N/A
998 (Developing countries, unspecified)	2,000,000	2,655,337	committed	10 (ODA)	110 (grant)	mitigation	N/A
998 (Developing countries, unspecified)	300,000	398,301	committed	10 (ODA)	110 (grant)	cross-cutting	N/A
451 (Paraguay)	300,000	398,301	committed	10 (ODA)	110 (grant)	cross-cutting	N/A
998 (Developing countries, unspecified)	1,000,000	1,327,669	committed	10 (ODA)	110 (grant)	mitigation	N/A
745 (Laos)	1,500,000	1,991,503	committed	10 (ODA)	110 (grant)	cross-cutting	N/A
Total contributions through bilateral, regional and other channels	92,505,000	122,815,985					

Table 7.3b: Provision of public financial support: contribution through bilateral, regional and other channels in 2014

Recipient country/ region/project/programme	*Total amount*		*Status*	*Funding source*	*Financial instrument*	*Type of support*	*Sector*
	Climate-specific						
	European euro - EUR	*USD*					
289 (South of Sahara, regional)	200,000	265,358	committed	10 (ODA)	110 (standard grant)	adaptation	430 (Other multisector)
259 (Mozambique)	700,000	928,751	committed	10 (ODA)	110 (standard grant)	mitigation	311 (AGRICULTURE)
285 (Uganda)	2,000,000	2,653,576	committed	10 (ODA)	110 (standard grant)	cross-cutting	140 (WATER AND SANITATION)
282 (Tanzania)	100,000	132,679	committed	10 (ODA)	110 (standard grant)	adaptation	311 (AGRICULTURE)
364 (Nicaragua)	50,000	66,339	committed	10 (ODA)	110 (standard grant)	mitigation	113 (Secondary education [incl. vocational education/training])
232 (Chad)	27,550	36,553	committed	10 (ODA)	110 (standard grant)	adaptation	311 (AGRICULTURE)
232 (Chad)	43,550	57,782	committed	10 (ODA)	110 (standard grant)	adaptation	311 (AGRICULTURE)
660 (Nepal)	93,300	123,789	committed	10 (ODA)	110 (standard grant)	adaptation	311 (AGRICULTURE)
679 (South Asia, regional)	228,600	303,304	committed	10 (ODA)	110 (standard grant)	mitigation	332 (TOURISM)
832 (Fiji)	100,000	132,679	committed	10 (ODA)	110 (standard grant)	adaptation	311 (AGRICULTURE)
238 (Ethiopia)	249,700	331,299	committed	10 (ODA)	110 (standard grant)	adaptation	430 (Other multisector)
655 (Maldives)	200,000	265,358	committed	10 (ODA)	110 (standard grant)	mitigation	230 (ENERGY GENERATION AND SUPPLY)
998 (Developing countries, unspecified)	383,700	509,088	committed	10 (ODA)	110 (standard grant)	mitigation	230 (ENERGY GENERATION AND SUPPLY)
289 (South of Sahara, regional)	48,000	63,686	committed	10 (ODA)	110 (standard grant)	mitigation	230 (ENERGY GENERATION AND SUPPLY)
289 (South of Sahara, regional)	400,000	530,715	committed	10 (ODA)	110 (standard grant)	adaptation	430 (Other multisector)
289 (South of Sahara, regional)	257,350	341,449	committed	10 (ODA)	110 (standard grant)	mitigation	230 (ENERGY GENERATION AND SUPPLY)
389 (North & Central America, regional)	1,300,000	1,724,824	committed	10 (ODA)	110 (standard grant)	cross-cutting	230 (ENERGY GENERATION AND SUPPLY)
298 (Africa, regional)	27,014	35,842	committed	10 (ODA)	110 (standard grant)	cross-cutting	410 (General environmental protection)
89 (Europe, regional)	200,000	265,358	committed	10 (ODA)	110 (standard grant)	mitigation	430 (Other multisector)
88 (States Ex-Yugoslavia unspecified)	525,000	696,564	committed	10 (ODA)	110 (standard grant)	cross-cutting	410 (General environmental protection)
612 (Georgia)	900,000	1,194,109	committed	10 (ODA)	110 (standard grant)	mitigation	312 (FORESTRY)
93 (Moldova)	190,195	252,348	committed	10 (ODA)	110 (standard grant)	adaptation	140 (WATER AND SANITATION)
285 (Uganda)	25,000	33,170	committed	10 (ODA)	110 (standard grant)	mitigation	230 (ENERGY GENERATION AND SUPPLY)
364 (Nicaragua)	25,000	33,170	committed	10 (ODA)	110 (standard grant)	adaptation	740 (Disaster prevention and preparedness)

248 (Kenya)	12,500	16,585	committed	10 (ODA)	110 (standard grant)	adaptation	151 (Government and civil society, general)
998 (Developing countries, unspecified)	1,000,000	1,326,788	committed	10 (ODA)	110 (standard grant)	adaptation	140 (WATER AND SANITATION)
998 (Developing countries, unspecified)	700,000	928,751	committed	10 (ODA)	110 (standard grant)	cross-cutting	230 (ENERGY GENERATION AND SUPPLY)
998 (Developing countries, unspecified)	2,000,000	2,653,576	committed	10 (ODA)	110 (standard grant)	adaptation	740 (Disaster prevention and preparedness)
89 (Europe, regional)	1,500,000	1,990,182	committed	10 (ODA)	110 (standard grant)	adaptation	430 (Other multisector)
619 (Central Asia, regional)	661,376	877,505	committed	10 (ODA)	110 (standard grant)	cross-cutting	230 (ENERGY GENERATION AND SUPPLY)
489 (South America, regional)	804,764	1,067,751	committed	10 (ODA)	110 (standard grant)	cross-cutting	410 (General environmental protection)
489 (South America, regional)	402,059	533,446	committed	10 (ODA)	110 (standard grant)	cross-cutting	430 (Other multisector)
89 (Europe, regional)	1,000,000	1,326,788	committed	10 (ODA)	110 (standard grant)	cross-cutting	230 (ENERGY GENERATION AND SUPPLY)
619 (Central Asia, regional)	1,000,000	1,326,788	committed	10 (ODA)	110 (standard grant)	cross-cutting	430 (Other multisector)
619 (Central Asia, regional)	1,000,000	1,326,788	committed	10 (ODA)	110 (standard grant)	cross-cutting	230 (ENERGY GENERATION AND SUPPLY)
89 (Europe, regional)	3,000,000	3,980,364	committed	10 (ODA)	110 (standard grant)	cross-cutting	230 (ENERGY GENERATION AND SUPPLY)
689 (South & Central Asia, regional)	1,613,944	2,141,361	committed	10 (ODA)	110 (standard grant)	cross-cutting	230 (ENERGY GENERATION AND SUPPLY)
489 (South America, regional)	206,500	273,982	committed	10 (ODA)	110 (standard grant)	mitigation	0
998 (Developing countries, unspecified)	4,000,000	5,307,151	committed	10 (ODA)	110 (standard grant)	mitigation	430 (Other multisector)
298 (Africa, regional)	500,000	663,394	committed	10 (ODA)	110 (standard grant)	adaptation	140 (WATER AND SANITATION)
798 (Asia, regional)	28,500	37,813	committed	10 (ODA)	110 (standard grant)	mitigation	430 (Other multisector)
798 (Asia, regional)	76,000	100,836	committed	10 (ODA)	110 (standard grant)	mitigation	410 (General environmental protection)
798 (Asia, regional)	168,000	222,900	committed	10 (ODA)	110 (standard grant)	mitigation	230 (ENERGY GENERATION AND SUPPLY)
389 (North & Central America, regional)	75,000	99,509	committed	10 (ODA)	110 (standard grant)	adaptation	311 (AGRICULTURE)
679 (South Asia, regional)	66,500	88,231	committed	10 (ODA)	110 (standard grant)	adaptation	312 (AGRICULTURE)
238 (Ethiopia)	150,000	199,018	committed	10 (ODA)	110 (standard grant)	adaptation	313 (AGRICULTURE)
259 (Mozambique)	66,500	88,231	committed	10 (ODA)	110 (standard grant)	adaptation	314 (AGRICULTURE)
489 (South America, regional)	804,000	1,066,737	committed	10 (ODA)	110 (standard grant)	mitigation	410 (General environmental protection)
753 (Mongolia)	339,350	450,245	committed	10 (ODA)	110 (standard grant)	mitigation	14050 (Waste management/disposal)
745 (Laos)	1,599,990	2,122,847	committed	10 (ODA)	110 (standard grant)	cross-cutting	312 (FORESTRY)
451 (Paraguay)	300,000	398,036	committed	10 (ODA)	110 (standard grant)	mitigation	311 (AGRICULTURE)
238 (Ethiopia)	63,130	83,760	committed	10 (ODA)	110 (standard grant)	mitigation	312 (FORESTRY)
255 (Mali)	38,030	50,458	committed	10 (ODA)	110 (standard grant)	mitigation	312 (FORESTRY)

998 (Developing countries, unspecified)	70,000	92,875	committed	10 (ODA)	110 (standard grant)	cross-cutting	410 (General environmental protection)
289 (South of Sahara, regional)	33,000	43,784	committed	10 (ODA)	110 (standard grant)	adaptation	410 (General environmental protection)
630 (Bhutan)	30,000	39,804	committed	10 (ODA)	110 (standard grant)	adaptation	410 (General environmental protection)
298 (Africa, regional)	14,500	19,238	committed	10 (ODA)	110 (standard grant)	cross-cutting	311 (AGRICULTURE)
431 (Brazil)	14,500	19,238	committed	10 (ODA)	110 (standard grant)	mitigation	410 (General environmental protection)
755 (Philippines)	10,500	13,931	committed	10 (ODA)	110 (standard grant)	adaptation	720 (Emergency Response)
285 (Uganda)	57,000	75,627	committed	10 (ODA)	110 (standard grant)	cross-cutting	311 (AGRICULTURE)
431 (Brazil)	2,000	2,654	committed	10 (ODA)	110 (standard grant)	mitigation	410 (General environmental protection)
431 (Brazil)	5,000	6,634	committed	10 (ODA)	110 (standard grant)	mitigation	410 (General environmental protection)
998 (Developing countries, unspecified)	150	199	committed	10 (ODA)	110 (standard grant)	mitigation	410 (General environmental protection)
282 (Tanzania)	7,000	9,288	committed	10 (ODA)	110 (standard grant)	mitigation	140 (WATER AND SANITATION)
261 (Nigeria)	7,500	9,951	committed	10 (ODA)	110 (standard grant)	mitigation	230 (ENERGY GENERATION AND SUPPLY)
238 (Ethiopia)	8,900	11,808	committed	10 (ODA)	110 (standard grant)	adaptation	430 (Other multisector)
287 (Burkina Faso)	2,500	3,317	committed	10 (ODA)	110 (standard grant)	mitigation	160 (OTHER SOCIAL INFRASTRUCTURE AND SERVICES)
287 (Burkina Faso)	2,000	2,654	committed	10 (ODA)	110 (standard grant)	mitigation	321 (INDUSTRY)
364 (Nicaragua)	3,100	4,113	committed	10 (ODA)	110 (standard grant)	mitigation	230 (ENERGY GENERATION AND SUPPLY)
364 (Nicaragua)	9,000	11,941	committed	10 (ODA)	110 (standard grant)	mitigation	230 (ENERGY GENERATION AND SUPPLY)
428 (Bolivia)	11,000	14,595	committed	10 (ODA)	110 (standard grant)	mitigation	230 (ENERGY GENERATION AND SUPPLY)
282 (Tanzania)	7,000	9,288	committed	10 (ODA)	110 (standard grant)	mitigation	311 (AGRICULTURE)
998 (Developing countries, unspecified)	300,000	398,036	committed	10 (ODA)	110 (standard grant)	mitigation	230 (ENERGY GENERATION AND SUPPLY)
645 (India)	25,000	33,170	committed	10 (ODA)	110 (standard grant)	mitigation	410 (General environmental protection)
434 (Chile)	185,000	245,456	committed	10 (ODA)	110 (standard grant)	mitigation	230 (ENERGY GENERATION AND SUPPLY)
612 (Georgia)	2,470,000	3,277,166	provided	20 (OOF)	000 (non-concessional development loan)	mitigation	400 (MULTISECTOR/CROSS-CUTTING)
351 (Honduras)	1,720,000	2,282,075	provided	20 (OOF)	000 (non-concessional development loan)	mitigation	230 (ENERGY GENERATION AND SUPPLY)
71 (Albania)	2,120,000	2,812,790	provided	20 (OOF)	000 (non-concessional development loan)	mitigation	230 (ENERGY GENERATION AND SUPPLY)
998 (Developing countries, unspecified)	1,950,000	2,587,236	provided	20 (OOF)	000 (non-concessional development loan)	mitigation	400 (MULTISECTOR/CROSS-CUTTING)
998 (Developing countries, unspecified)	15,400,000	20,432,533	provided	20 (OOF)	000 (non-concessional	mitigation	400 (MULTISECTOR/CROSS-CUTTING)

					development loan)		
366 (Panama)	18,920,000	25,102,826	provided	20 (OOF)	000 (non-concessional development loan)	mitigation	230 (ENERGY GENERATION AND SUPPLY)
57 (Kosovo)	985,000	1,306,886	provided	20 (OOF)	1100 (guarantees/insurance NEW)	mitigation	230 (ENERGY GENERATION AND SUPPLY)
612 (Georgia)	320,000	424,572	provided	20 (OOF)	1100 (guarantees/insurance NEW)	mitigation	230 (ENERGY GENERATION AND SUPPLY)
645 (India)	9,200,000	12,206,448	provided	20 (OOF)	1100 (guarantees/insurance NEW)	mitigation	230 (ENERGY GENERATION AND SUPPLY)
660 (Nepal)	46,000	61,032	provided	10 (ODA)	512 (equity other)	mitigation	400 (MULTISECTOR/CROSS-CUTTING)
730 (China)	149,000	197,691	provided	20 (OOF)	453 (bank exp.cred.)	cross-cutting	311 (AGRICULTURE)
351 (Honduras)	318,500	422,582	provided	20 (OOF)	453 (bank exp.cred.)	cross-cutting	311 (AGRICULTURE)
351 (Honduras)	3,245,000	4,305,427	provided	20 (OOF)	453 (bank exp.cred.)	cross-cutting	311 (AGRICULTURE)
745 (Laos)	2,380,000	3,157,755	provided	20 (OOF)	453 (bank exp.cred.)	cross-cutting	311 (AGRICULTURE)
269 (Senegal)	548,000	727,080	provided	20 (OOF)	453 (bank exp.cred.)	mitigation	230 (ENERGY GENERATION AND SUPPLY)
282 (Tanzania)	4,835,000	6,415,019	provided	20 (OOF)	453 (bank exp.cred.)	mitigation	230 (ENERGY GENERATION AND SUPPLY)
241 (Ghana)	2,892,000	3,837,070	provided	20 (OOF)	453 (bank exp.cred.)	mitigation	230 (ENERGY GENERATION AND SUPPLY)
Total contributions through bilateral, regional and other channels	99,753,251	132,351,401					

Table 7.3c: Provision of public financial support: contribution through bilateral, regional and other channels in 2015

Recipient country/ region/project/programme	*Total amount*		*Status*	*Funding source*	*Financial instrument*	*Type of support*	*Sector*
	Climate-specific						
	European euro - EUR	*USD*					
057 Kosovo	200,000	221,484	committed	10 ODA	110 Standard Grant	cross-cutting	410 Cross-cutting
063 Serbia	250,000	276,855	committed	10 ODA	110 Standard Grant	adaptation	410 Cross-cutting
071 Albania	313,500	347,176	provided	22 OSEC	421 Standard loan	mitigation	140 Water and Sanitation
085 Ukraine	5,200	5,759	committed	10 ODA	110 Standard Grant	cross-cutting	231 Energy
085 Ukraine	20,000	22,148	committed	10 ODA	110 Standard Grant	mitigation	231 Energy
089 Europe, regional	198,000	219,269	committed	10 ODA	110 Standard Grant	adaptation	740 Other
089 Europe, regional	2,500,000	2,768,549	committed	10 ODA	110 Standard Grant	adaptation	140 Water and Sanitation
089 Europe, regional	64,000	70,875	committed	10 ODA	110 Standard Grant	cross-cutting	151 Other
089 Europe, regional	750,000	830,565	committed	10 ODA	110 Standard Grant	cross-cutting	430 Cross-cutting
089 Europe, regional	2,000,000	2,214,839	committed	10 ODA	110 Standard Grant	mitigation	231 Energy
089 Europe, regional	500,000	553,710	committed	10 ODA	110 Standard Grant	mitigation	430 Cross-cutting
142 Egypt	200,000	221,484	committed	10 ODA	110 Standard Grant	cross-cutting	232 Energy
189 North of Sahara, regional	5,000	5,537	committed	10 ODA	110 Standard Grant	mitigation	231 Energy
232 Chad	100,000	110,742	committed	10 ODA	110 Standard Grant	adaptation	311 Agriculture
238 Ethiopia	89,723	99,360	committed	10 ODA	110 Standard Grant	adaptation	311 Agriculture
241 Ghana	1,629,000	1,803,987	provided	22 OSEC	421 Standard loan	mitigation	231 Energy
248 Kenya	15,000	16,611	committed	10 ODA	110 Standard Grant	adaptation	151 Other
248 Kenya	36,304	40,204	committed	10 ODA	110 Standard Grant	mitigation	151 Other
248 Kenya	10,000	11,074	committed	10 ODA	110 Standard Grant	mitigation	113 Other
249 Lesotho	112,161	124,209	committed	10 ODA	110 Standard Grant	adaptation	140 Water and Sanitation
260 Niger	90,000	99,668	committed	10 ODA	110 Standard Grant	adaptation	311 Agriculture
269 Senegal	1,835	2,032	committed	10 ODA	110 Standard Grant	mitigation	140 Water and Sanitation
279 South Sudan	5,000	5,537	committed	10 ODA	110 Standard Grant	mitigation	232 Energy
282 Tanzania	3,025	3,350	committed	10 ODA	110 Standard Grant	adaptation	311 Agriculture
282 Tanzania	5,000	5,537	committed	10 ODA	110 Standard Grant	adaptation	311 Agriculture

282 Tanzania	5,000	5,537	committed	10 ODA	110 Standard Grant	mitigation	231 Energy
282 Tanzania	72,609	80,408	committed	10 ODA	110 Standard Grant	mitigation	232 Energy
282 Tanzania	543,000	601,329	provided	22 OSEC	421 Standard loan	mitigation	231 Energy
285 Uganda	1,000,000	1,107,420	committed	10 ODA	110 Standard Grant	cross-cutting	140 Water and Sanitation
285 Uganda	775,000	858,250	committed	10 ODA	110 Standard Grant	cross-cutting	140 Water and Sanitation
285 Uganda	225,000	249,169	committed	10 ODA	110 Standard Grant	cross-cutting	140 Water and Sanitation
285 Uganda	33,279	36,854	committed	10 ODA	110 Standard Grant	mitigation	231 Energy
285 Uganda	30,254	33,503	committed	10 ODA	110 Standard Grant	mitigation	231 Energy
285 Uganda	4,000	4,430	committed	10 ODA	110 Standard Grant	mitigation	232 Energy
287 Burkina Faso	12,500	13,843	committed	10 ODA	110 Standard Grant	adaptation	311 Agriculture
287 Burkina Faso	48,350	53,544	committed	10 ODA	110 Standard Grant	adaptation	311 Agriculture
287 Burkina Faso	40,000	44,297	committed	10 ODA	110 Standard Grant	mitigation	232 Energy
287 Burkina Faso	200,000	221,484	committed	10 ODA	110 Standard Grant	mitigation	311 Agriculture
289 South of Sahara, regional	12,500	13,843	committed	10 ODA	110 Standard Grant	adaptation	311 Agriculture
289 South of Sahara, regional	6,050	6,700	committed	10 ODA	110 Standard Grant	adaptation	311 Agriculture
289 South of Sahara, regional	825,000	913,621	committed	10 ODA	110 Standard Grant	adaptation	114 Other
289 South of Sahara, regional	1,000,000	1,107,420	committed	10 ODA	110 Standard Grant	adaptation	140 Water and Sanitation
289 South of Sahara, regional	65,000	71,982	committed	10 ODA	110 Standard Grant	mitigation	231 Energy
289 South of Sahara, regional	250,000	276,855	committed	10 ODA	110 Standard Grant	mitigation	231 Energy
289 South of Sahara, regional	7,300,000	8,084,164	provided	10 ODA	520 CIV shares	mitigation	232 Energy
298 Africa, regional	250,000	276,855	committed	10 ODA	110 Standard Grant	mitigation	232 Energy
364 Nicaragua	72,609	80,408	committed	10 ODA	110 Standard Grant	adaptation	410 Cross-cutting
364 Nicaragua	15,000	16,611	committed	10 ODA	110 Standard Grant	mitigation	232 Energy
364 Nicaragua	3,000	3,322	committed	10 ODA	110 Standard Grant	mitigation	232 Energy
364 Nicaragua	4,500	4,983	committed	10 ODA	110 Standard Grant	mitigation	232 Energy
389 North & Central America, regional	90,000	99,668	committed	10 ODA	110 Standard Grant	adaptation	311 Agriculture
389 North & Central America, regional	225,000	249,169	committed	10 ODA	110 Standard Grant	mitigation	311 Agriculture
389 North & Central America, regional	56,500	62,569	committed	10 ODA	110 Standard Grant	mitigation	231 Energy
428 Bolivia	5,500	6,091	committed	10 ODA	110 Standard Grant	mitigation	232 Energy
431 Brazil	10,000	11,074	committed	10 ODA	110 Standard Grant	adaptation	312 Forestry

431 Brazil	29,000	32,115	committed	10 ODA	110 Standard Grant	mitigation	410 Cross-cutting
431 Brazil	2,075	2,298	committed	10 ODA	110 Standard Grant	mitigation	410 Cross-cutting
431 Brazil	4,500	4,983	committed	10 ODA	110 Standard Grant	mitigation	410 Cross-cutting
431 Brazil	20,000	22,148	committed	10 ODA	110 Standard Grant	mitigation	312 Forestry
437 Colombia	1,298	1,438	committed	10 ODA	110 Standard Grant	mitigation	430 Cross-cutting
457 Suriname	30,000	33,223	committed	10 ODA	110 Standard Grant	cross-cutting	312 Forestry
498 America, regional	81,489	90,243	committed	10 ODA	110 Standard Grant	cross-cutting	430 Cross-cutting
498 America, regional	250,000	276,855	committed	10 ODA	110 Standard Grant	cross-cutting	430 Cross-cutting
498 America, regional	465,000	514,950	committed	10 ODA	110 Standard Grant	mitigation	231 Energy
610 Armenia	240,000	265,781	committed	10 ODA	110 Standard Grant	adaptation	740 Other
610 Armenia	599,970	664,419	committed	10 ODA	110 Standard Grant	adaptation	311 Agriculture
610 Armenia	250,000	276,855	committed	10 ODA	110 Standard Grant	adaptation	311 Agriculture
610 Armenia	63,800	70,653	committed	10 ODA	110 Standard Grant	mitigation	230 Energy
611 Azerbaijan	102,000	112,957	committed	10 ODA	110 Standard Grant	adaptation	740 Other
612 Georgia	160,000	177,187	committed	10 ODA	110 Standard Grant	adaptation	740 Other
612 Georgia	35,000	38,760	committed	10 ODA	110 Standard Grant	cross-cutting	232 Energy
612 Georgia	1,000,000	1,107,420	committed	10 ODA	110 Standard Grant	mitigation	312 Forestry
612 Georgia	5,500,000	6,090,808	provided	10 ODA	520 CIV shares	mitigation	232 Energy
619 Central Asia, regional	138,774	153,681	committed	10 ODA	110 Standard Grant	cross-cutting	430 Cross-cutting
630 Bhutan	9,976	11,048	committed	10 ODA	110 Standard Grant	mitigation	321 Industry
640 Sri Lanka	1,622,000	1,796,235	provided	22 OSEC	421 Standard loan	mitigation	140 Water and Sanitation
645 India	1,400	1,550	committed	10 ODA	110 Standard Grant	cross-cutting	410 Cross-cutting
660 Nepal	47,050	52,104	committed	10 ODA	110 Standard Grant	adaptation	740 Other
660 Nepal	200,000	221,484	committed	10 ODA	110 Standard Grant	mitigation	230 Energy
666 Bangladesh	15,000	16,611	committed	10 ODA	110 Standard Grant	mitigation	240 Other
679 South Asia, regional	10,000	11,074	committed	10 ODA	110 Standard Grant	mitigation	232 Energy
689 South & Central Asia, regional	101,700	112,625	committed	10 ODA	110 Standard Grant	mitigation	231 Energy
730 China	2,500	2,769	committed	10 ODA	110 Standard Grant	cross-cutting	312 Forestry
730 China	470,000	520,487	provided	22 OSEC	421 Standard loan	mitigation	140 Water and Sanitation
730 China	229,500	254,153	provided	22 OSEC	421 Standard loan	mitigation	140 Water and Sanitation

745 Laos	70,000	77,519	provided	22 OSEC	421 Standard loan	cross-cutting	311 Agriculture
755 Philippines	7,500	8,306	committed	10 ODA	110 Standard Grant	adaptation	311 Agriculture
798 Asia, regional	51,773	57,334	committed	10 ODA	110 Standard Grant	cross-cutting	210 Transport
798 Asia, regional	66,493	73,636	committed	10 ODA	110 Standard Grant	cross-cutting	232 Energy
998 Developing countries, unspecified	129,039	142,900	committed	10 ODA	110 Standard Grant	adaptation	740 Other
998 Developing countries, unspecified	105,000	116,279	committed	10 ODA	110 Standard Grant	adaptation	998 Other
998 Developing countries, unspecified	7,500	8,306	committed	10 ODA	110 Standard Grant	cross-cutting	411 Cross-cutting
998 Developing countries, unspecified	115,906	128,357	committed	10 ODA	110 Standard Grant	mitigation	231 Energy
998 Developing countries, unspecified	174	192	committed	10 ODA	110 Standard Grant	mitigation	410 Cross-cutting
998 Developing countries, unspecified	85,000	94,131	committed	10 ODA	110 Standard Grant	mitigation	998 Other
998 Developing countries, unspecified	81,000	89,701	committed	10 ODA	110 Standard Grant	mitigation	998 Other
998 Developing countries, unspecified	8,763	9,705	committed	10 ODA	110 Standard Grant	adaptation	410 Cross-cutting
998 Developing countries, unspecified	30,000	33,223	committed	10 ODA	110 Standard Grant	adaptation	410 Cross-cutting
998 Developing countries, unspecified	250,000	276,855	committed	10 ODA	110 Standard Grant	cross-cutting	231 Energy
998 Developing countries, unspecified	10,000	11,074	committed	10 ODA	110 Standard Grant	cross-cutting	312 Forestry
998 Developing countries, unspecified	30,000	33,223	committed	10 ODA	110 Standard Grant	cross-cutting	410 Cross-cutting
998 Developing countries, unspecified	20,000	22,148	committed	10 ODA	110 Standard Grant	cross-cutting	410 Cross-cutting
998 Developing countries, unspecified	40,000	44,297	committed	10 ODA	110 Standard Grant	cross-cutting	410 Cross-cutting
998 Developing countries, unspecified	203,675	225,554	committed	10 ODA	110 Standard Grant	cross-cutting	410 Cross-cutting
998 Developing countries, unspecified	100,000	110,742	committed	10 ODA	110 Standard Grant	mitigation	231 Energy
998 Developing countries, unspecified	261,125	289,175	committed	10 ODA	110 Standard Grant	mitigation	231 Energy
998 Developing countries, unspecified	51,000	56,478	committed	10 ODA	110 Standard Grant	mitigation	231 Energy
998 Developing countries, unspecified	2,000,000	2,214,839	committed	10 ODA	110 Standard Grant	mitigation	232 Energy
998 Developing countries, unspecified	1,000,000	1,107,420	committed	10 ODA	110 Standard Grant	mitigation	250 Other
998 Developing countries, unspecified	11,085	12,276	committed	10 ODA	110 Standard Grant	mitigation	410 Cross-cutting
998 Developing countries, unspecified	20,000	22,148	committed	10 ODA	110 Standard Grant	mitigation	410 Cross-cutting
998 Developing countries, unspecified	10,000	11,074	committed	10 ODA	110 Standard Grant	mitigation	410 Cross-cutting
998 Developing countries, unspecified	88,779	98,316	committed	10 ODA	110 Standard Grant	mitigation	410 Cross-cutting
998 Developing countries, unspecified	20,000	22,148	committed	10 ODA	110 Standard Grant	mitigation	410 Cross-cutting
998 Developing countries, unspecified	20,000	22,148	committed	10 ODA	110 Standard Grant	mitigation	410 Cross-cutting

998 Developing countries, unspecified	1,000,000	1,107,420	committed	10 ODA	110 Standard Grant	mitigation	430 Cross-cutting
998 Developing countries, unspecified	69,756,000	77,249,169	provided	20 OOF	900 Other	mitigation	430 Cross-cutting
Total contributions through bilateral, regional and other channels	109.614.242	121.388.972					

Table 7.3d: Provision of public financial support: contribution through bilateral, regional and other channels in 2016

Recipient country/ region/project/programme	*Total amount*		*Status*	*Funding source*	*Financial instrument*	*Type of support*	*Sector*
	Climate-specific						
	European euro - EUR	*USD*					
063 Serbia	10,000	11,062	committed	10 ODA	110 Standard Grant	mitigation	140 Water and Sanitation
064 Bosnia and Herzegovina	34,977	38,691	committed	10 ODA	110 Standard Grant	mitigation	232 Energy
065 Montenegro	39,950	44,192	committed	10 ODA	110 Standard Grant	cross-cutting	232 Energy
066 Macedonia	69,690	77,091	committed	10 ODA	110 Standard Grant	mitigation	410 Cross-Cutting
085 Ukraine	7,959	8,805	committed	10 ODA	110 Standard Grant	mitigation	231 Energy
085 Ukraine	17,790	19,680	committed	10 ODA	110 Standard Grant	mitigation	231 Energy
085 Ukraine	4,378	4,843	committed	10 ODA	110 Standard Grant	mitigation	231 Energy
085 Ukraine	8,445	9,342	committed	10 ODA	110 Standard Grant	mitigation	231 Energy
086 Belarus	29,541	32,678	committed	10 ODA	110 Standard Grant	mitigation	232 Energy
086 Belarus	3,800	4,204	committed	10 ODA	110 Standard Grant	mitigation	232 Energy
088 States of ex-Yugoslavia, unspecified	1,500,000	1,659,292	committed	10 ODA	110 Standard Grant	mitigation	231 Energy
089 Europe, regional/multi-country	1,500,000	1,659,292	committed	10 ODA	110 Standard Grant	adaptation	410 Cross-Cutting
089 Europe, regional/multi-country	1,000,000	1,106,195	committed	10 ODA	110 Standard Grant	mitigation	232 Energy
089 Europe, regional/multi-country	479,983	530,955	committed	10 ODA	110 Standard Grant	mitigation	232 Energy
089 Europe, regional/multi-country	1,000,000	1,106,195	committed	10 ODA	110 Standard Grant	mitigation	250 Other (Business and other services)
089 Europe, regional/multi-country	250,000	276,549	committed	10 ODA	110 Standard Grant	mitigation	410 Cross-Cutting
089 Europe, regional/multi-country	1,500,000	1,659,292	committed	10 ODA	110 Standard Grant	mitigation	430 Cross-Cutting
093 Moldova	196,000	216,814	committed	10 ODA	110 Standard Grant	adaptation	410 Cross-Cutting
142 Egypt	250,000	276,549	committed	10 ODA	110 Standard Grant	mitigation	232 Energy
142 Egypt	10,000	11,062	committed	10 ODA	110 Standard Grant	mitigation	232 Energy
142 Egypt	3,500,000	3,871,681	committed	21 OOF	421 Standard loan	cross-cutting	311 Agriculture
218 South Africa	18,973,532	20,988,420	committed	21 OOF	421 Standard loan	mitigation	232 Energy
238 Ethiopia	1,000,000	1,106,195	committed	10 ODA	110 Standard Grant	adaptation	122 Other (Basic health)
238 Ethiopia	175,000	193,584	committed	10 ODA	110 Standard Grant	cross-cutting	151 Other (Government and civil society, general)

238 Ethiopia	770,000	851,770	committed	10 ODA	110 Standard Grant	mitigation	113 Other (Secondary education)
238 Ethiopia	55,558	61,457	committed	10 ODA	110 Standard Grant	mitigation	410 Cross-Cutting
241 Ghana	100,000	110,619	committed	10 ODA	110 Standard Grant	mitigation	232 Energy
241 Ghana	100,000	110,619	committed	10 ODA	110 Standard Grant	mitigation	232 Energy
244 Guinea-Bissau	350,000	387,168	committed	10 ODA	110 Standard Grant	mitigation	232 Energy
248 Kenya	154,000	170,354	committed	10 ODA	110 Standard Grant	mitigation	430 Cross-Cutting
259 Mozambique	350,000	387,168	committed	10 ODA	110 Standard Grant	adaptation	311 Agriculture
259 Mozambique	120,000	132,743	committed	10 ODA	110 Standard Grant	adaptation	740 Other (Disaster prevention and preparedness)
261 Nigeria	9,000	9,956	committed	10 ODA	110 Standard Grant	mitigation	311 Agriculture
265 Zimbabwe	10,000	11,062	committed	10 ODA	110 Standard Grant	cross-cutting	311 Agriculture
266 Rwanda	75,000	82,965	committed	10 ODA	110 Standard Grant	adaptation	430 Cross-Cutting
269 Senegal	520,647	575,937	committed	10 ODA	110 Standard Grant	cross-cutting	430 Cross-Cutting
279 South Sudan	500	553	committed	10 ODA	110 Standard Grant	mitigation	232 Energy
279 South Sudan	16,500	18,252	committed	10 ODA	110 Standard Grant	mitigation	232 Energy
282 Tanzania	2,500	2,765	committed	10 ODA	110 Standard Grant	adaptation	740 Other (Disaster prevention and preparedness)
282 Tanzania	7,500	8,296	committed	10 ODA	110 Standard Grant	cross-cutting	140 Water and Sanitation
282 Tanzania	109,690	121,339	committed	10 ODA	110 Standard Grant	cross-cutting	430 Cross-Cutting
283 Togo	6,000	6,637	committed	10 ODA	110 Standard Grant	mitigation	232 Energy
285 Uganda	10,000	11,062	committed	10 ODA	110 Standard Grant	adaptation	140 Water and Sanitation
285 Uganda	500,000	553,097	committed	10 ODA	110 Standard Grant	cross-cutting	140 Water and Sanitation
285 Uganda	1,200,000	1,327,434	committed	10 ODA	110 Standard Grant	cross-cutting	140 Water and Sanitation
285 Uganda	225,000	248,894	committed	10 ODA	110 Standard Grant	cross-cutting	140 Water and Sanitation
285 Uganda	50,000	55,310	committed	10 ODA	110 Standard Grant	cross-cutting	312 Forestry
285 Uganda	10,000	11,062	committed	10 ODA	110 Standard Grant	mitigation	231 Energy
287 Burkina Faso	65,000	71,903	committed	10 ODA	110 Standard Grant	adaptation	311 Agriculture
287 Burkina Faso	65,000	71,903	committed	10 ODA	110 Standard Grant	adaptation	311 Agriculture
287 Burkina Faso	98,000	108,407	committed	10 ODA	110 Standard Grant	cross-cutting	410 Cross-Cutting
287 Burkina Faso	1,500	1,659	committed	10 ODA	110 Standard Grant	mitigation	140 Water and Sanitation
287 Burkina Faso	1,078	1,192	committed	10 ODA	110 Standard Grant	mitigation	232 Energy

289 South of Sahara, regional/multi-country	375,000	414,823	committed	10 ODA	110 Standard Grant	cross-cutting	151 Other (Government and civil society, general)
289 South of Sahara, regional/multi-country	2,000,000	2,212,389	committed	10 ODA	110 Standard Grant	mitigation	232 Energy
289 South of Sahara, regional/multi-country	4,200,000	4,646,018	committed	10 ODA	520 Shares in collective investment vehicles	mitigation	232 Energy
298 Africa, regional/multi-country	500,000	553,097	committed	10 ODA	110 Standard Grant	adaptation	140 Water and Sanitation
298 Africa, regional/multi-country	2,000,000	2,212,389	committed	10 ODA	110 Standard Grant	cross-cutting	140 Water and Sanitation
298 Africa, regional/multi-country	29,997	33,182	committed	10 ODA	110 Standard Grant	mitigation	140 Water and Sanitation
298 Africa, regional/multi-country	500,000	553,097	committed	10 ODA	110 Standard Grant	mitigation	231 Energy
298 Africa, regional/multi-country	70,000	77,434	committed	10 ODA	110 Standard Grant	mitigation	232 Energy
336 Costa Rica	12,451,380	13,773,651	committed	21 OOF	421 Standard loan	mitigation	232 Energy
338 Cuba	10,000	11,062	committed	10 ODA	110 Standard Grant	mitigation	311 Agriculture
342 El Salvador	48,000	53,097	committed	10 ODA	110 Standard Grant	adaptation	311 Agriculture
342 El Salvador	113,503	125,556	committed	10 ODA	110 Standard Grant	adaptation	311 Agriculture
342 El Salvador	112,305	124,231	committed	10 ODA	110 Standard Grant	cross-cutting	311 Agriculture
347 Guatemala	118,563	131,153	committed	10 ODA	110 Standard Grant	adaptation	311 Agriculture
347 Guatemala	10,000	11,062	committed	10 ODA	110 Standard Grant	mitigation	232 Energy
364 Nicaragua	12,500	13,827	committed	10 ODA	110 Standard Grant	mitigation	231 Energy
364 Nicaragua	10,000	11,062	committed	10 ODA	110 Standard Grant	mitigation	232 Energy
364 Nicaragua	556,989	616,139	committed	10 ODA	210 Interest subsidy	mitigation	232 Energy
364 Nicaragua	1,779,000	1,967,920	committed	10 ODA	210 Interest subsidy	mitigation	232 Energy
364 Nicaragua	3,839,650	4,247,400	committed	22 OSEC	421 Standard loan	mitigation	232 Energy
389 North & Central America, regional/multi-country	565,000	625,000	committed	10 ODA	110 Standard Grant	adaptation	740 Other (Disaster prevention and preparedness)
425 Argentina	50,000	55,310	committed	10 ODA	110 Standard Grant	mitigation	312 Forestry
428 Bolivia	10,000	11,062	committed	10 ODA	110 Standard Grant	mitigation	232 Energy
428 Bolivia	9,000	9,956	committed	10 ODA	110 Standard Grant	mitigation	232 Energy
431 Brazil	29,000	32,080	committed	10 ODA	110 Standard Grant	cross-cutting	151 Other (Government and civil society, general)
431 Brazil	10,600	11,726	committed	10 ODA	110 Standard Grant	cross-cutting	151 Other (Government and civil society, general)

431 Brazil	9,000	9,956	committed	10 ODA	110 Standard Grant	cross-cutting	151 Other (Government and civil society, general)
431 Brazil	7,270	8,042	committed	10 ODA	110 Standard Grant	cross-cutting	410 Cross-Cutting
431 Brazil	475,000	525,442	committed	10 ODA	110 Standard Grant	mitigation	231 Energy
431 Brazil	74,500	82,412	committed	10 ODA	110 Standard Grant	mitigation	232 Energy
437 Colombia	10,000	11,062	committed	10 ODA	110 Standard Grant	cross-cutting	311 Agriculture
451 Paraguay	399,790	442,246	committed	10 ODA	110 Standard Grant	mitigation	312 Forestry
457 Suriname	48,000	53,097	committed	10 ODA	110 Standard Grant	mitigation	312 Forestry
489 South America, regional/multi-country	45,712	50,567	committed	10 ODA	110 Standard Grant	adaptation	140 Water and Sanitation
498 America, regional/multi-country	472,233	522,381	committed	10 ODA	110 Standard Grant	adaptation	140 Water and Sanitation
498 America, regional/multi-country	43,098	47,674	committed	10 ODA	110 Standard Grant	cross-cutting	430 Cross-Cutting
498 America, regional/multi-country	5,692,060	6,296,526	committed	21 OOF	421 Standard loan	mitigation	232 Energy
612 Georgia	200,000	221,239	committed	10 ODA	110 Standard Grant	mitigation	232 Energy
612 Georgia	231,969	256,603	committed	10 ODA	110 Standard Grant	mitigation	232 Energy
612 Georgia	900,000	995,575	committed	10 ODA	110 Standard Grant	mitigation	321 Industry
619 Central Asia, regional/multi-country	5,000	5,531	committed	10 ODA	110 Standard Grant	adaptation	140 Water and Sanitation
619 Central Asia, regional/multi-country	1,356,450	1,500,498	committed	10 ODA	110 Standard Grant	mitigation	321 Industry
630 Bhutan	140,000	154,867	committed	10 ODA	110 Standard Grant	adaptation	311 Agriculture
630 Bhutan	3,500	3,872	committed	10 ODA	110 Standard Grant	adaptation	311 Agriculture
630 Bhutan	224,500	248,341	committed	10 ODA	110 Standard Grant	cross-cutting	312 Forestry
645 India	36,000	39,823	committed	10 ODA	110 Standard Grant	cross-cutting	410 Cross-Cutting
645 India	15,000,000	16,592,920	committed	21 OOF	421 Standard loan	mitigation	232 Energy
660 Nepal	15,000	16,593	committed	10 ODA	110 Standard Grant	adaptation	730 Other (Reconstruction relief and rehabilitation)
660 Nepal	55,850	61,781	committed	10 ODA	110 Standard Grant	adaptation	740 Other (Disaster prevention and preparedness)
660 Nepal	18,000	19,912	committed	10 ODA	110 Standard Grant	cross-cutting	410 Cross-Cutting
666 Bangladesh	9,486,766	10,494,210	committed	21 OOF	421 Standard loan	mitigation	232 Energy
689 South & Central Asia, regional/multi-country	600,000	663,717	committed	10 ODA	110 Standard Grant	cross-cutting	410 Cross-Cutting
730 China	1,980	2,190	committed	10 ODA	110 Standard Grant	mitigation	232 Energy

730 China	24,360	26,947	committed	10 ODA	110 Standard Grant	mitigation	232 Energy
730 China	1,000	1,106	committed	10 ODA	110 Standard Grant	mitigation	410 Cross-Cutting
730 China	2,355	2,605	committed	10 ODA	110 Standard Grant	mitigation	410 Cross-Cutting
745 Laos	44,900	49,668	committed	10 ODA	110 Standard Grant	mitigation	232 Energy
798 Asia, regional/multi-country	147,014	162,626	committed	10 ODA	110 Standard Grant	mitigation	210 Transport
798 Asia, regional/multi-country	192,392	212,823	committed	10 ODA	110 Standard Grant	mitigation	232 Energy
889 Oceania, regional/multi-country	2,500	2,765	committed	10 ODA	110 Standard Grant	adaptation	998 Other
889 Oceania, regional/multi-country	600,000	663,717	committed	10 ODA	110 Standard Grant	cross-cutting	231 Energy
998 Bilateral unallocated	146,381	161,926	committed	10 ODA	110 Standard Grant	adaptation	160 Other (Other social infrastructure and services)
998 Bilateral unallocated	25,000	27,655	committed	10 ODA	110 Standard Grant	adaptation	410 Cross-Cutting
998 Bilateral unallocated	146,396	161,943	committed	10 ODA	110 Standard Grant	adaptation	430 Cross-Cutting
998 Bilateral unallocated	2,400,000	2,654,867	committed	10 ODA	110 Standard Grant	cross-cutting	210 Transport
998 Bilateral unallocated	250,000	276,549	committed	10 ODA	110 Standard Grant	cross-cutting	231 Energy
998 Bilateral unallocated	6,900	7,633	committed	10 ODA	110 Standard Grant	cross-cutting	240 Other (Banking and financial services)
998 Bilateral unallocated	50,000	55,310	committed	10 ODA	110 Standard Grant	cross-cutting	410 Cross-Cutting
998 Bilateral unallocated	20,000	22,124	committed	10 ODA	110 Standard Grant	cross-cutting	410 Cross-Cutting
998 Bilateral unallocated	28,565	31,599	committed	10 ODA	110 Standard Grant	cross-cutting	410 Cross-Cutting
998 Bilateral unallocated	30,000	33,186	committed	10 ODA	110 Standard Grant	cross-cutting	410 Cross-Cutting
998 Bilateral unallocated	10,000	11,062	committed	10 ODA	110 Standard Grant	cross-cutting	410 Cross-Cutting
998 Bilateral unallocated	50,000	55,310	committed	10 ODA	110 Standard Grant	cross-cutting	410 Cross-Cutting
998 Bilateral unallocated	45,000	49,779	committed	10 ODA	110 Standard Grant	cross-cutting	410 Cross-Cutting
998 Bilateral unallocated	8,000	8,850	committed	10 ODA	110 Standard Grant	cross-cutting	410 Cross-Cutting
998 Bilateral unallocated	20,000	22,124	committed	10 ODA	110 Standard Grant	mitigation	231 Energy
998 Bilateral unallocated	193,572	214,128	committed	10 ODA	110 Standard Grant	mitigation	231 Energy
998 Bilateral unallocated	49,720	55,000	committed	10 ODA	110 Standard Grant	mitigation	232 Energy
998 Bilateral unallocated	70,000	77,434	committed	10 ODA	110 Standard Grant	mitigation	232 Energy
998 Bilateral unallocated	500,000	553,097	committed	10 ODA	110 Standard Grant	mitigation	232 Energy
998 Bilateral unallocated	10,000	11,062	committed	10 ODA	110 Standard Grant	mitigation	321 Industry
998 Bilateral unallocated	20,000	22,124	committed	10 ODA	110 Standard Grant	mitigation	410 Cross-Cutting
998 Bilateral unallocated	16,984	18,788	committed	10 ODA	110 Standard Grant	mitigation	410 Cross-Cutting

998 Bilateral unallocated	17,800	19,690	committed	10 ODA	110 Standard Grant	mitigation	410 Cross-Cutting
998 Bilateral unallocated	15,200	16,814	committed	10 ODA	110 Standard Grant	mitigation	410 Cross-Cutting
998 Bilateral unallocated	22,049	24,391	committed	10 ODA	110 Standard Grant	mitigation	410 Cross-Cutting
998 Bilateral unallocated	11,915	13,180	committed	10 ODA	110 Standard Grant	mitigation	410 Cross-Cutting
998 Bilateral unallocated	12,000	13,274	committed	10 ODA	110 Standard Grant	mitigation	410 Cross-Cutting
998 Bilateral unallocated	10,000	11,062	committed	10 ODA	110 Standard Grant	mitigation	410 Cross-Cutting
998 Bilateral unallocated	500,000	553,097	committed	10 ODA	110 Standard Grant	mitigation	430 Cross-Cutting
998 Bilateral unallocated	20,000	22,124	committed	10 ODA	110 Standard Grant	mitigation	998 Other
998 Bilateral unallocated	10,000,000	11,061,947	committed	21 OOF	421 Standard loan	cross-cutting	232 Energy
998 Bilateral unallocated	5,000,000	5,530,973	committed	21 OOF	431 Subordinated loan	mitigation	231 Energy
Total contributions through bilateral, regional and other channels	122,225,686	135,205,405					

7.2 Technology development and transfer

Austria is a pioneer nation in environmental technologies. Austrian cutting-edge technologies in the fields of solar energy and photovoltaics (for hot water supply and supplementary heating, but also for environmentally sound refrigeration and the production of cold from heat), wind and hydropower for the generation of electricity, biomass (for the generation of electricity, heat and organic fuels), waste treatment, air and water purification as well as ecological construction are used world-wide. Currently about 200,000 people are employed in Austria's environmental sector. The turnover generated amounted to Euro 33.9 billion in 2015, which is about 10 % of the GDP. Austria's vision continues - not only to become a leading supplier of environmental technology and services - but also to increase the production and supply of energy from renewable sources as well as energy efficiency measures at home.

Austria is committed to a range of actions to advance technology development and transfer. Technology for mitigation and adaptation is a component of many of the programmes and projects supported by Austria's climate finance commitments. Some examples are highlighted in the tables below.

The Austrian Development Cooperation (ADC)[4] has a strong focus on sustainable energy, in particular hydro and solar power as well as dissemination of decentralised renewable energy solutions. Furthermore, ADC does support initiatives by Austrian enterprises in developing countries. Most often, the fields of interests are related to renewable energy (especially solar energy systems) and energy efficient buildings. The granted funding by this "business partnerships programme" has to be matched by at least the same amount of the enterprises own funds. This is why business partnership projects, can serve as an incubator for private investments.

About ten years ago, most of ADC's financial support to the energy sector was dedicated to the construction and maintaining of hydropower plants for the national energy supply of partner countries. In 2007, the first contribution agreement to the regional "Energy and Environment Partnership" (EEP) in Central America was signed, and since 2009 the focus of ADC's energy portfolio is on regional initiatives that support the development and dissemination of decentralised renewable energy solutions, help mitigate existing barriers to renewable energy and energy efficiency markets, investments and industries and promote south-south and triangular experience exchange. Therewith, the support of applied research and technology transfer gains importance within the energy portfolio.

Although not all renewable energy sources are equally recommended in view of their direct GHG emissions, it has to be taken into account that in Africa, where most of the above

[4] Bilateral Austrian Development Cooperation

mentioned regional initiatives take place, almost all energy currently used is coming either from fossil fuel and gas, or from wooden biomass. In this regard, a switch to energy efficient solutions or any non-wood renewable energy source is a significant contribution to combatting deforestation and therewith indirectly mitigating atmospheric GHG emissions.

In the context of rural development projects and programs, which are following a multisector, interlinked and systemic approach, the entry points for climate change mitigation are correspondingly divers: Activities to avoid deforestation and degradation of vegetation and soils are matched by the search for alternative energy sources respectively energy efficiency solutions for household, sustainable and climate-smart agricultural production (i.e. climate-resilient seeds) and small business activities.

Another important actor is OeEB, which acts as the official Development Bank of Austria. As a private sector financial institution it has been mandated by the Republic of Austria to promote economically, environmentally and socially sustainable development through financing and investing in profitable private sector projects in developing and transition countries and through the provision of advisory services. Renewable energy as well as energy and resource efficiency are areas of special focus. By end-2016, OeEB had directly co-financed renewable energy projects for EUR 162.8 million. In addition, OeEB supports renewable energy and energy efficiency projects through local financial intermediaries. By end-2016, local financial institutions had used EUR 299.9 million of OeEB's funds to finance renewable energy projects with a total credit volume of EUR 1,799 million (including equity and credit volume of co-financing partners). This enable the construction of 1,525 MW newly installed capacity from renewable resources.

OeEB's total committed loan portfolio for projects contributing to the mitigation of climate change amounted to EUR 602.8 million by end-2016 (including equity and credit volume of co-financing partners). This included financing for the construction of hydro, solar, wind and geothermal power plants employing adequate technology as well as projects for the refurbishment of existing hydro plants and transmission lines and measures to enhance energy efficiency. In addition, advisory services were provided, inter alia, for training local financial institution staff to build up a green finance business line and in support of the national energy sector regulator of a developing country. Finally, OeEB also provided funding to technical assistance facilities of the Green for Growth Fund and the Global Climate Partnership Fund.

In addition to coordinating the reporting of Austria's climate finance contributions the Austrian Ministry of Agriculture, Forestry, Environment and Water Management undertakes concrete cooperation projects in partner countries. The National Designated Entity (NDE) for the Climate Technology Centre and Network is located in the Ministry. Furthermore the Ministry also nominated a member for the Technology Executive Committee who served two

terms (four year) and was actively engaged in the development and implementation of TEC's rolling work plan.

Further initiatives of the Austrian government, such as the joint environmental-technologies initiative of the Ministry of Agriculture, Forestry, Environment and Water Management and the Federal Economic Chamber and the export promotion scheme "go international" by the Federal Ministry of Science, Research and Economy and the Austrian Economic Chamber, support export oriented SMEs and hence supports technology transfer. It provides support and strengthens the export orientation of SMEs. Information events abroad present the offers and capacities of Austrian environmental technology and service providers. In addition to the opportunity of participating in various seminars in the target markets, participants present their environmental-technology products and services. The goods and services offered by the enterprises selling environmental technologies are presented also in joint catalogues and business guides. As part of the bilateral economic commissions for trade and economic cooperation and other bilateral formats, the Federal Ministry of Science, Research and Economy promotes cooperation in the field of environmental technologies with several Non- European countries. Specific working groups with a focus on technology transfer have been implemented with countries such as Belarus, China and Iran.

Austria is also member of institutions and initiatives that focus on technology development and transfer, e.g. Renewable Energy and Energy Efficiency Partnership (REEEP), Private Financing Advisory Network (PFAN), Sustainable Energy for All and Climate Technology Initiative (CTI). REEEP (located in Vienna) is a public private partnership for scaling up clean energy business models in developing countries and emerging markets and collaborates with PFAN on business models for technology transfer. The main goal of CTI was to support climate technology transfer towards developing countries. Its term expired in June 2017. PFAN is a multilateral, public-private partnership and is hosted by the United Nations Industrial Development Organization (UNIDO) and REEEP. PFAN identifies promising clean energy projects in Asia, Africa and Latin America at an early stage and provides mentoring for development of a business plan, investment pitch, and growth strategy, significantly enhancing the prospect of financial closure; it has already brought about quite a number of projects with significant GHG mitigation.

Since 1999, Austria is playing a key role as initiator and supporter of the Global Forum on Sustainable Energy (GFSE). GFSE is a neutral multi-stakeholder platform that is facilitating international dialogue on energy for sustainable development by taking into accounts the special interests and challenges of developing countries. It plays an active role and cooperates with UNIDO in the preparation of the Vienna Energy Forum (VEF).

Some examples of programmes and projects supporting development and transfer of technology:

Table 7.4: Selection of projects with respect to provision of technology development and transfer support

Project/programme title: Contribution to the Energy and Environment Programme in Southern and Eastern Africa			
Purpose: Broad range and increased level of renewable energy service solutions adopted in energy related policies and strategies and implemented by public and private stakeholders			
Recipient country	**Sector**	**Total funding**	**Years in operation**
Southern and Eastern Africa Region	power generation/ renewable sources	EUR 4.000.000.- (from Austria, in total 60 M€ from Austria, Finland (Delegated lead) and Great Britain	January 2010 – January 2017
Description: The overall objective of the EEP-S&EA is increased access to modern, affordable and reliable energy services through an increased usage of renewable energy technologies. The overall objective is expected to be reached by achieving result areas: (i) Market understanding, institutional support and knowledge management; (ii) Opportunities for public and private financing for project and business development; and (iii) Financing implementation of national or regional pilot and demonstration projects. EEP primarily provides grant support to renewable energy and energy efficiency projects and it also provides business development support as well as and a knowledge management and dissemination. Geographically EEP is spread around in the 13 EEP S&EA countries in Southern and Eastern Africa.			
Indicate factors that led to project's success: • Project investment nearby 200 M€, 80% private sector led projects, rest are NGOs, academia, and municipalities, Average grant size €255,000 with average project size of €766,000 • 225 projects funded for feasibility studies, pilots, demonstrations, scale-up & replication • nearly 600,000 households have benefited from improved access to sustainable energy through the projects • combined annual CO_2 emission reduction potential of the 103 completed projects of over 700,000 tons • installed 1.3 MW of new renewable energy generation capacity (mostly solar PV) • saved an estimated 615,000 MWh through promotion of energy efficiency technologies • 6,000 jobs created, of which 2100 for women and girls			
Technology transferred: all types of renewable energy and energy efficiency solutions			
Impact on greenhouse gas emissions: Combined the 103 completed project have annual CO_2 emission reduction potential of over 700,000 tons.			

Project/programme title: Support to the ECOWAS Regional Centre for Renewable Energy and Energy Efficiency (ECREEE)			
Purpose: Increase access to modern energy services by promoting the adoption of renewable energy and energy efficient technologies and services in ECOWAS member states thereby supporting the region's economic and social development in an environmentally benign manner.			
Recipient country	**Sector**	**Total funding**	**Years in operation**
West Africa Region	energy policy and administrative management	EUR 1.800.000.- (2009-2013); EUR 2.000.000,- (2013-2018)	November 2009 – December 2018
Description: The first phase of the project aimed to establish and operationalize the ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE). ECREEE's overall objective is to contribute to the sustainable economic, social and environmental development of West Africa by improving access to modern, reliable and affordable energy services, energy security and reduction of energy-related externalities (GHG, local pollution). This will be achieved by the creation of functional renewable energy and energy efficiency markets in the region through developing regional policy and regulatory frameworks, raising awareness and enhancing capacities of market players and enablers, investment promotion and advocacy as well as knowledge management, project support and technology transfer. At the end of its first business plan period (2011-2016). ECREEE has developed into a regional centre of excellence and catalyst for the initiatives of ECOWAS member states to address energy challenges both nationally and regionally. The centre has played a critical role in the adoption of an ECOWAS community vision of ensuring universal access to sustainable energy by 2030 and the approval of four major regional policies on renewable energy, energy efficiency, bioenergy and gender.			

Successful technical programmes and projects include the ECOWAS Small Scale Hydropower programme, the EREF project, the ECOWAS Renewable Energy Entrepreneurship Support Facility, the ECOWAS Observatory for Renewable Energy and Energy Efficiency, and others.

Indicate factors which led to project's success:

- The strong cooperation with the ECOWAS Secretariat and all ECOWAS member state ministries implied strong regional ownership that can be shown by engagement of the member states own budgets
- Integration into existing regional structures and processes
- The mix of local and international staff in ECREEE ensures good exchange of ideas and know-how transfer (in both directions)
- Regional programmes and initiatives created a high visibility of the centre, and a stronger awareness for renewable energy and energy efficiency within the region
- The strong technical portfolio and activities with international visibility achieved the cooperation with a broad range of donors and international organisations for several years
- A consequent strategic approach led to a long-term business plan, adopted by all member states
- Long-term and strategic regional approaches help mitigate barriers to national and regional sustainable energy markets
- Cooperation, knowledge and experience exchange within the Global Network of Regional Sustainable Energy Centres

Technology transferred: All types of renewable energy and energy efficiency solutions

Impact on greenhouse gas emissions: The region's energy sector is characterized by the interrelated challenges of energy access, energy security, climate change mitigation and adaptation, which are intertwined with economic development challenges. The ECOWAS region has significant but unevenly distributed energy resources yet inter-state energy trade is minimal. Traditional biomass is the main source of energy for the majority poor and accounts for 80% of total energy consumed for domestic purposes. This is why all types of renewable energy solutions can be regarded as contribution to avoid deforestation and GHG emissions, even if the exact amount of avoided GHG emissions is difficult to estimate.

The overall rate of access to electricity in the ECOWAS region stands at around 45% of the population, with a strong urban to rural divide. A total of 23,000 MW of hydroelectric potential is concentrated in five of the 15 Member States, of which only 16% has been exploited. There are considerable wind energy resources along the coastal region and on specific sites inland and the region has vast solar energy potential with very high radiation averages of 5 to 6 kWh/m2 throughout the year that largely go unexploited.

Project/programme title: First operational phase of the Pacific Centre for Renewable Energy and Energy Efficiency (PCREEE)

Purpose: Improved access to modern, affordable and reliable energy services, energy security and mitigation of negative externalities of the energy system (GHG emissions, local pollution) by promoting renewable energy and energy efficiency investments, markets and industries in Pacific Island Countries and Territories (PICTs)

Recipient country	Sector	Total funding	Years in operation
Oceania/Pacific Island Countries and Territories	Energy policy and administrative management	EUR 600.000.-	December 2016 – November 2020

Description:

PCREEE was established by the Pacific Ministers of Energy and Transport as regional SE4ALL centre of excellence operating under the umbrella of the Framework for Action on Energy Security in the Pacific (FAESP). Through regional methodologies and tools, the centre assists PICTs in addressing existing barriers and in strengthening drivers for sustainable energy markets, industries and innovation.

PCREEE's activities respond to the specific needs and challenges of small island developing states and focus on activities and projects with regional impact, or national projects that demonstrate high potential for upscaling or regional replication. Main working areas are private sector policy advisory services, capacity development, knowledge management and awareness raising, as well as investment and business development.

PCREEE supports activities with high relevance for the domestic private sector and industry. The centre promotes:

1. Sustainable energy solutions and technologies to enhance the productivity and competitiveness of island industries with high value and job creation potential (e.g. agriculture, tourism, fishery, manufacturing, creative industry);
2. Nexus-approaches which combine sustainable energy interventions with productive activities (e.g. value chain

development) and other aspects of circular economy (e.g. resource efficiency, cleaner production, waste and water management, recycling);
3. Sustainable energy entrepreneurship, industrial development and innovation;
The centre promotes all appropriate and sustainable renewable energy and energy efficiency technologies, including renewable energy hybrid systems and mini-grids. In doing so, the centre focuses equally on RE&EE.

Indicate factors which led to project's success:

- Strong cooperation with the Pacific Community and the ministries of its partner states and territories which ensures ownership on regional and national levels
- Cooperation, knowledge and experience exchange within the Global Network of Regional Sustainable Energy Centres, which allows for a south-south and triangular partnership
- Integration into existing regional structures and processes
- Regional programmes and initiatives that address crucial challenges to the region and its partner states and territories, which were identified in a consultative preparatory process
- Targeted early actions with high visibility that address voiced needs of its partner states, combined with a consistent and long-term strategic approach to developing the technical portfolio
- Long-term and strategic regional activities aimed to help mitigate barriers to national and regional sustainable energy markets

Technology transferred: All types of renewable energy and energy efficiency solutions

Impact on greenhouse gas emissions:

As in most small island states, the PICTS are vulnerable to volatile prices of global oil markets due to their high dependency on imported petroleum products. The region is responsible for less than 0,1% of global energy-related GHG emissions, but highly vulnerable to the effects of climate change, such as rising sea levels, changes in rainfall patterns and higher frequencies of extreme weather events. Enhancing resilience of energy and other infrastructure is another concern of critical importance for energy planning and maintenance. For this reason, all types of renewable energy and energy efficiency measures can be regarded as contribution to avoid GHG emissions and support adaptation to climate change, even if the amount of avoided GHG emissions cannot be estimated at the time of reporting.
Renewable energy and energy efficiency measures were identified as key drivers for stable and sustainable economic development and for strengthening the resilience of the energy infrastructure. This will require the scaling up of renewable energy and energy efficiency deployment in the region, the replication of successful models and approaches and the strengthening of the local business sector.

Project/programme title: Southern African Solar Thermal Training and Demonstration Initiative (SOLTRAIN)

Purpose: broad dissemination of technically improved solar thermal systems in the participating SADC countries

Recipient country	Sector	Total funding	Years in operation
Botswana, Lesotho, Mozambique, Namibia, South Africa, Zimbabwe	Solar energy	EUR 680.000.- (2009-2012), EUR 1.675.900.- (2012-2016) Euro 2.000.000,-- (2016 – 2019)	March 2009-June 2019

Description:
SOLTRAIN is a regional initiative on capacity building and demonstration of solar thermal solutions in the SADC region. SOLTRAIN partner countries are Botswana, Lesotho, Mozambique, Namibia, South Africa and Zimbabwe. SOLTRAIN supports them in their switch from a fossil fuel based energy supply to a sustainable energy supply, specifically in the application of solar thermal solution.
This should be achieved by building up training capacities in the field of solar thermal technology and the improvement of the quality, performance and lifetime of solar thermal systems. Nevertheless, SOLTRAIN focusses also on other crucial areas:
By using targeted campaigns SOLTRAIN makes aware of the wide range of application areas for solar thermal systems to relevant stakeholders and the public are made aware. Awareness raising also includes showing the benefits of solar thermal systems concerning energy supply, poverty alleviation, job creation and the protection of the natural environment.
SOLTRAIN sets up solar thermal demonstration plants in order to apply the knowledge taught in the training programmes to installers, students and politicians. Both smaller and bigger plants are set up in social institutions and small and medium enterprises at which they will contribute to water heating, cooling and the generation of process heat.

Indicate factors that led to project's success:
SOLTRAIN has raised awareness and demonstrated in its first two phases what can be done with solar thermal:

- 25 stakeholder workshops with 812 participants took place in the partner countries to inform stakeholders from industry, education, policy, administration, social institutions and the financing sector about the broad implementation of renewable energy technologies, in particular of solar thermal technologies.
- 80 technical training courses for University staff, vocational training centres and industry, were carried out with a total of 2150 participants.
- 187 solar thermal systems demonstrate the potential of solar thermal solutions in the residential and industrial sector to reduce electrify demand and costs as well as CO_2 emissions
- The annual solar yield of all solar thermal systems installed in the first and second phase SOLTRAIN was 1500 MWh. This corresponds to electricity savings of 1650 MWh/a and 522 tons of avoided CO_2. The avoided electricity cost corresponds to ZAR 3.5 million.

And with the support of SOLTRAIN national roadmaps for solar thermal systems ranging from small-scale systems to large systems for hotels, hospitals and industrial applications have been adopted in all partner countries.

Technology transferred: solar thermal systems

Impact on greenhouse gas emissions: The annual solar yield of all solar thermal systems installed in the first and second phase SOLTRAIN was 1500 MWh. This corresponds to electricity savings of 1 650 MWh/a and 522 tons of avoided CO_2.

Project/programme title: Regional Development Programme Boucle de Mouhoun

Purpose: The population in the project area benefit from a better life quality through sustainable and locally owned development of their living conditions.

Recipient country	Sector	Total funding	Years in operation
Burkina Faso	Rural development	EUR 2.500.000.- (third phase)	Pilot phase since March 2006, fully operational phase September 2009-December 2012, third phase December 2013 until June 2018

Description:
The programme is based on a regional development fund as the principal financing instrument and with the Regional Council as the responsible authority for implementation. The fund serves for financing investments at community level (urban and rural communities) based on local development plans. Apart from this the financial resources are used for strengthening sustainable management of natural resources, training of farmers and artisans, i.e. dissemination of sustainable agricultural methods, post-harvest management, production of organic fertilizers, promotion of drip irrigation, promotion of renewable energies etc. As there is no functioning grid in the region, the need for other local energy sources than wood and expensive fossil fuel was constantly addressed by the beneficiaries. From 2010 onwards, a partnership between this program and the National Biogas Initiative allowed the training of local craftspeople to build biogas digesters for individual households and small businesses. The introduction of locally available construction materials significantly contributed to reduce the installation costs per unit.

Indicate factors that led to project's success: Intensive information and awareness building activities went hand in hand with respect of local ownership. This allowed real engagement since all investments are based on local development plans and thus demanded by the local/regional partners and not proposed by donors. The third phase focussed more on environmental protection and climate change adaptation (e.g. through introduction and promotion of more climate-resilient seeds). Anyway, the awareness is not always matched yet by an appropriate know-how.

Technology transferred: dissemination of information and trainings regarding sustainable management of natural resources, sustainable agricultural methods, integrated watershed management, reforestation and forest protection; renewable non-wood energy solutions (especially biogas digesters).

Project title: Strengthening of micro-enterprises with solar-powered chargers in Western Africa

Purpose:
The business partnership aims at contributing to affordable, cost-saving and environmentally friendly energy services for rural populations and facilitating entrepreneurship by strengthening the capacity of solar-charging micro-entrepreneurs.

Recipient country	Sector	Total funding	Years in operation
Ghana	Solar energy	EUR 200.000.-	01.01.2016 - 31.03.2018

Description:

100+ micro-entrepreneurs, of which 50% are women, will act as solar-charging micro-entrepreneurs in rural areas; 2-3 full-time employees will be hired, more than 5 sales agents and middle men will be trained on the solar devices (use, distribution, cables, maintenance); 4.000 solar charges are distributed and sold per year, and 20.000+ household members will have access to solar-charging devices through the entrepreneurs who are able to scale up over time and become multipliers in their area.

In addition, socially and economically disadvantaged members of society will have facilitated grants to afford the solar devices. The panels will be used in rural areas granting light, the ability to charge phones, or use small electronic devices, for cheaper and clean access to modern energy services. Particular focus will be placed on the promotion and training of women entrepreneurs.

The components consist of training for micro-entrepreneurs to use the PowerTAB, for business development, on- and off-line quality support, co-financing of socially disadvantaged people, as well as looking at possibilities to use local African designs for the incorporation into the Solar devices and SunnyBag. Furthermore, the partners will transmit information in trainings about waste disposal and will also take back broken devices within a 2-year warranty period, with incentives to get a new PowerTAB.

Indicate factors that led to project's success:

Adaptation of the product according to local needs. While the technology came from Austria, a strong accent has been laid on capacity development.

Technology transferred: Solar technology

Project title: Market development and market penetration for high-quality solar thermal systems in Egypt and their integration in the tourism industry

Purpose: Provide Egyptian market with reliable solar thermal systems

Recipient country	Sector	Total funding	Years in operation
Egypt	Solar energy	EUR 500,000	01.04.2013 – 01.10.2017

Description:

Four Austrian companies (Sekem Energy GmbH, GreenOneTec GmbH, PINK GmbH, Reischl Technical Office) and six Egyptian partners (Sekem Development Foundation, EcoEnergy, Heliopolis University, E-Green, Solar AlShams Co for New and Renewable Energies, Georenco) established a strategic alliance to make reliable high-quality solar thermal systems available for the Egyptian market.

The goal of the strategic alliance was to provide the Egyptian market with reliable solar thermal systems by combining technical components developed in Austria with locally available components and by educating local professionals to maximize the value added in Egypt over the medium term.

Project activities include the establishment of a local production site of solar collectors as well as the construction of solar thermal demonstration systems for sales purposes and for research and development. In cooperation with the Heliopolis University state-recognized training facilities for solar engineers were created to attract the necessary specialists for the growing solar industry. In order to encourage the development of financing models for solar thermal plants in Egypt training was provided for local financing institutions and for public authorities.

Indicate factors that led to project's success:

- High level of local ownership
- Local sourcing wherever possible
- Efficient division of labour between Austrian and Egyptian partners

Technology transferred: Solar thermal systems

Project title: Paving new ways for sustainable solar photovoltaic solutions in Egypt			
Purpose: Develop the Egyptian market for sustainable solar photovoltaic solutions			
Recipient country	**Sector**	**Total funding**	**Years in operation**
Egypt	Solar energy	EUR 500,000	01.11.2016 - 31.10.2019

Description:
The project is implemented by a group of four Austrian companies - Sekem Energy GmbH, Elektro Merl GmbH, BFI Burgenland and Sattler & Schanda Rechtsanwälte GBR and their Egyptian partners.
In cooperation with the Egyptian partners, the Heliopolis University, the American University of Cairo and the Vocational Training Center Belbeis, technical knowledge about the professional installation, operation and maintenance of photovoltaic systems is made available. Local educational institutions are supported in enhancing and expanding their curriculum. Government agencies are given the opportunity to train their employees. Higher safety and quality standards in the PV sector are defined and made available to the public.
Heliopolis University, the American University in Cairo and the Vocational Training Center Belbeis include PV-trainings in their curricula to reach out to 300 students and 30 apprentices per year.
The employees of the New Urban Community Authority (NUCA) and Egyptian Environmental Affairs Agency (EEAA) take part in the PV trainings and train 140 skilled workers per year nationwide.
Project activities include an analysis of existing PV-plants and an assessment of locally available components for PV systems, the construction of a PV demonstration plant for research and training purposes, the training of PV technicians and the development of a PV platform in Egypt.

Indicate factors that led to project's success:
Project is being implemented.

- High level of local ownership
- Strong linkages to public institutions
- Local sourcing wherever possible
- Efficient division of labour between Austrian and Egyptian partners

Technology transferred: Solar photovoltaic systems

Project/programme title: Mongolia: Wind Farm Salkhit			
Purpose: Supply of energy from wind power; reduce share of electricity generation using non-renewable sources			
Recipient country	**Sector**	**Total funding**	**Years in operation**
Mongolia	Renewable Energy	US$ 856,000	Since 2012

Description: Wind farm (first in Mongolia) with a capacity of 50 MW and transmission line is constructed in Salkhit, Mongolia. OeEB provides funding jointly with other bilateral and multilateral development banks.

Indicate factors which led to project's success: use of adequate technology; suitable project structure; strong financing partners.

Technology transferred: wind farm.

Impact on greenhouse gas emissions/sinks: 115,000 persons can be supplied with clean energy, 180,000 tons CO_2 p.a. saved.

Project/programme title: Nicaragua: San Jacinto Geothermal Power Plant			
Purpose: Supply of energy from geothermal sources; reduce share of electricity generation using non-renewable sources			
Recipient country	**Sector**	**Total funding**	**Years in operation**
Nicaragua	Renewable Energy	US$ 15.1 million	Since 2013 (Phase 2)

Description: Geothermal power plant (expansion of a pilot plant) with a capacity of up to 72 MW is planned and installed in San Jacinto, Nicaragua. OeEB provides funding jointly with other bilateral and multilateral development banks.

Indicate factors which led to project's success: use of adequate technology.

Technology transferred: geothermal power plant.
Impact on greenhouse gas emissions/sinks: Ca. 400,000 tons CO_2 p.a. saved.

Project/programme title: Honduras: La Vegona Hydro Power Plant			
Purpose: Supply of energy from hydrodynamic sources; reduce share of electricity generation using non-renewable sources			
Recipient country	**Sector**	**Total funding**	**Years in operation**
Honduras	Renewable Energy	US$ 23 million	Since 10/2015
Description: OeEB supported the construction of the 38.5-megawatt project with a US-Dollar 23 million parallel loan. IFC provided senior and subordinated debt totaling US-Dollar 30 million and has mobilised additional US-Dollar 45 million senior debt. The hydropower plant produces about 181 gigawatt hours of electricity a year, and powers thousands of households in the country. La Vegona also helps to improve the competitiveness and sustainability of Honduran exporters by supplying lower-cost energy from a clean source. La Vegona, a hydro power plant privately owned by Compania Hondurena de Energía Renovable S.A. (COHERSA) has been built in the north of Honduras on the Humuya/Comayagua river and carries an installed capacity of 38.5 MW. Construction was completed in 2015. The La Vegona hydro power plant contributes to a significant reduction in CO2 - emissions and a reduction in Honduras' dependency on imported fossil fuels.			
Indicate factors which led to project's success: use of adequate technology.			
Technology transferred: Two 19.25 MW Kaplan turbines			
Impact on greenhouse gas emissions/sinks: 181 GWh of power per year resulting in approx. 108,000 tons CO_2 saved p.a.			

Project/programme title: Frontier Energy II			
Purpose: A fund providing equity capital for renewable energy projects in order to improve Sub-Saharan Africa´s energy supply			
Recipient country	**Sector**	**Total funding**	**Years in operation**
Sub-Sahara Africa	Renewable Energy	US$ 5.000.000	Since 2016
Description: Investment in a fund targeting renewable energy projects in sub-saharan Africa. The underlying intention of the project is to provide financings for projects that provide alternatives based around renewable energy production instead of those types of energy projects, which would cause more greenhouse gas emissions.			
Indicate factors which led to project's success: Use of adequate technology; suitable project structure; strong financing partners			
Technology transferred: Hydropower, wind, geothermal			
Impact on greenhouse gas emissions/sinks: at the end of the fund life approximately 150,000 persons can be supplied with clean energy, 180,000 tons CO_2 p.a. saved.			

Project/programme title: Hydro Decision Support System Georgia			
Purpose: Strengthening the national regulatory body			
Recipient country	**Sector**	**Total funding**	**Years in operation**
Georgia	Energy	EUR 69.978,28	Since 2016
Description: Web-based Decision Support System to analyse the impact of climate change and water resource development in a certain area of Georgia			
Indicate factors which led to project's success: strong commitment from the national regulator, responsible for strategic			

development of the hydro power sector in Georgia; seasoned experts delivering TA services.
Technology transferred: know-how in respect of water resource and river basin management.

7.3 Capacity-building

Capacity-building is a key precondition for the efficient and effective implementation of climate action in developing countries. We recognize this fact by developing programmes, projects and initiatives with our partner countries in such a way that capacity-building is an integral part of most of the projects we support. CTF table 9 provides a small sample of projects that address capacity-building in a context-specific, results-oriented manner.

Some of the research partnerships funded by the Commission for Development Studies (see Section 8.2) contribute to the enhancement of endogenous capacities too.

As already mentioned in section 5.1, above, our bilateral programmes, projects and initiatives are developed and implemented in close cooperation with our partner countries. We therefore understand that they meet existing and emerging needs and interests expressed by our partner countries, including in relation to capacity-building.

Table 7.5: Selection of projects with a specific focus on capacity-building

Recipient country/region	*Targeted area*	*Programme or project title*	*Description of programme or project* [b,c]
Africa, regional	Cross-cutting	Water, Climate and Development Programme in Africa	The overall objective of WACDEP is to support integration of water security and climate resilience in development planning and decision making processes, through enhanced technical and institutional capacity and predictable financing and investments in water security and climate change adaptation.
Burkina Faso	Adaptation	Earmarked contribution to CGIAR: Nutrition Sensitive forest restoration to adapt to change - Burkina Faso	Nutrition-sensitive forest restoration to enhance the capacity of rural communities in Burkina Faso to adapt to change
China	Mitigation	Green Urban Development - Challenges in the fields of air quality and waste management/circular economy	A workshop was held in Beijing and focused on capacity building in the area of air quality, waste management and circular economy. Participants included representatives of Chinese Ministries, research institutions, regional and international organisations etc.
Ghana	Mitigation	Strengthening solar-charging micro-enterprises in West-Africa	The business partnership aims at contributing to affordable, cost-saving and environmentally-friendly energy services for rural populations and facilitating entrepreneurship by building the capacity of solar-charging micro-entrepreneurs.

Chapter 8

Research and Systematic Observation

8.1 General policy on and funding of research and systematic observation

Areas of competence and legal basis

- Basic infrastructure of universities and extra university research institutions is funded by the Federal Government.
- Public funds provide support for basic research as well as for applied research and technology development.
- The Federal Ministry of Science, Research and Economy and the Federal Ministry of Transport, Innovation and Technology hold a central position in co-ordination, administration and financing of research, they are responsible for industry-related research, technology development and innovation funding. The former is responsible for matters relating to universities and for non-university research institutions in the area of basic research and general scientific research.
- Federal ministries and provincial governments bear responsibility for research issues within their own specialised fields of competence, e.g. commissioned research regarding environment and climate change.
- Basic legal acts:
    - Research and Technology Funding Act (Forschungs- und Technologie-förderungsgesetz), sets up different, publicly financed research funds, in order to support basic research projects and projects in the field of industry-related applied research and development;
    - Research Organisation Act (Forschungsorganisationsgesetz), determines principles and targets in publicly funded research and sets out legal and organisational rules for research activities by universities and federal scientific institutions; the act also defines status and tasks of the Central Institute for Meteorology and Geodynamics with respect to research and observation;
    - Universities Act (Universitätsgesetz 2002), defines the set-up and structures of Austrian universities and their status as legal entities which may independently avail of their budgets.

Funding

- Research expenditure was estimated at € 11.3 billion in 2017, it has increased from below 2.91 % of GDP in 2012 to 3.14% in 2017.
- Domestic business sector contributes slightly less than half, the public sector more than one third to research expenditure, the rest stems mainly from abroad.
- Direct public funding of universities was 5.3% of federal expenditure and 1.2% of GDP in 2015.
- The day-to-day operation of the federal research institutions (predominantly the universities) and of independent institutions, such as the Academy of Sciences, and of umbrella organisations, is financed directly by public funding.

- Publicly endowed independent funds finance basic and application-oriented research and technology developments:
    - The Austrian Science Fund (FWF) is responsible for basic research funding; about 85% of the subsidies go to university researchers, mainly for basic research. Funding is provided for individual research projects, programmes, publications, grants, and awards. Applications for subsidies are subjected to stringent international peer-review. The total budget granted in 2016 was EUR 197 million.
    - The Austrian Research Promotion Agency (FFG) bears responsibility for financing of innovative projects in applied business-oriented research carried out by enterprises and co-operating scientific institutions. Support is given in the form of loans, interest rate subsidies and the assumption of liability. In 2016 about EUR 522 million were granted for projects (88 million in the area of energy and environment); about two third go to enterprises.

Research on environment and climate change

- Wide range of funding, ranging from the basic support of relevant university and extra-university institutes and specific, well-funded research programs to single projects commissioned by individual public authorities.
- Environmental issues are among the key areas of research commissioned by the Federal Ministry of Science, Research and Economy, the Federal Ministry of Transport, Innovation and Technology, the Federal Ministry of Agriculture and Forestry, Environment and Water Management, and the Länder.
- Relevant contributions to climate research also by several extra-university institutions, which are part of, controlled by, or (partly) funded by public authorities (e. g. Central Institute for Meteorology and Geodynamics, Federal Environment Agency, Hydrographical Central Bureau, Federal Research and Training Centre for Forests, Natural Hazards and Landscape (BFW), Austrian Agency for Health and Food Safety (AGES), the Austrian Institute of Technology (AIT), Joanneum Research, as well as environmental departments of the provincial governments.
- Some environment related mid-term research programmes are administered by the Austrian Academy of Sciences, e. g. on alpine research, on hydrology, as well as the UNESCO Man and Biosphere programme. The Austrian Academy of Sciences also hosts the Austrian National Committee on the Global Change Programmes, which is dedicated to establishing contacts with, and to funding Austrian contributions to the Global Research Programmes IGBP (International Geosphere-Biosphere Programme), WCRP (World Climate Research Programme) and IHDP (International Human Dimensions Programme on Global Environmental Change).
- The Climate Change Centre Austria (CCCA, http://www.ccca.ac.at/en/about-ccca/) has been established in 2011 as a coordinating facility to promote and support climate research in Austria:
    - Focus on strengthening the climate research landscape in Austria, facilitating the education of a new generation of researchers and supporting knowledge transfer and advising politics and society;
    - represents a network of 28 member organisations;
    - the CCCA Coordination Office provides administrative support and organizes annual climate reseach convention;

    - the CCCA Service Centre provides a clearing point for inquiries from the public and facilitates dissemination of information;
    - the CCCA Data Centre provides central national archive for relevant climate data and information (https://data.ccca.ac.at/)
- The Climate and Energy Fund (KLIEN, see also Section 4.3.1) supports RTD projects for the reduction of GHGs in Austria in the short, medium and long-term in several programmes with different focal areas (energy, mobility, etc.). Among these programmes is the "Austrian Climate Research Programme" (ACRP), funding basic climate system research as well as policy oriented projects, with EUR 5–6 million annually.
- Starting with 2003, the comparable small programme "StartClim" supports research on climate change impacts and adaptation options. For the years 2014–2016 main focus was put on projects dealing with implementation and monitoring of the Austrian Adaptation Strategy. The programme is financed by the Federal Ministry of Agriculture, Forestry, Environment and Water Management together with partners.

Open exchange of research results is usually given by the publication in scientific journals or as project reports by researchers or funding institutions. Observation data is increasingly submitted to international data centres.

8.2 Research

Climate change related research activities in Austria comprise climate system research, research on impacts and socio-economic aspects of climate change and on adaptation measures and mitigation.

Relevant research results with respect to climate change scenarios, impacts, mitigation and adaptation options have been compiled in the "Austrian Assessment Report Climate Change 2014" (see Section 6.1).

Climate Process and Climate System Studies

- Research performed with a wide spectrum of topics;
- Particular emphasis on processes influenced by topography, which is especially relevant for the Alps;
- Quite some emphasis on the hydrological cycle, including interaction with biosphere.

Modelling and Prediction, Including Global Circulation Models

- Mainly regional climate modelling for Austria and subregions;
- Austrian researchers also participate in EU-funded European research projects ;
- No GCM modelling by Austrian research institutions, but research activities that contribute to improving GCMs (e.g. remote sensing applications).

Research on the Impacts of Climate Change

- Research focuses on topics that are of vital interest to the country, e.g. floods, forests, agriculture, lakes, glaciers;

- Research programs (ACRP, StartClim, and ProVision) have been established to foster interdisciplinary research on climate change impacts; physical impacts are investigated together with socio-economic impacts and potential adaptation options;
- Focus on the effects of climatic change in the Alpine region due to its specific situation (elevated and complex topography, sensitivity to minor shifts in the general circulation).

Socio-economic analysis, including analysis of both, the impacts of climate change and response options

- Research on costs of climate change impacts for society (costs of inaction);
- Estimation of socio-economic impacts of mitigation technologies, e. g. costs and benefits related to the introduction of renewable energy systems;
- Development of regional response options aiming at reducing greenhouse gas emissions from energy generation plays a relevant role;
- Apart from energy related research topics also impacts and measures in other important sectors have been investigated, e.g. in agriculture and tourism.

Research and development on mitigation and adaptation technologies

- Research on mitigation and adaptation options addresses a broad range of topics in Austria;
- Energy technologies play an important role, especially biomass utilization and solar energy technologies;
- Considerable research in the private sector, including small and medium enterprises;
- Specific funding programmes stimulate research in the areas of energy, buildings, mobility, smart cities.

Support of developing countries

The Commission for Development Studies (KEF; Kommission für Entwicklungsforschung) OeAD-GmbH was founded already in 1981 as the Austrian follow-up measure to the UN conference on 'Science and Technology for Development'. Projects funded by KEF should contribute to sustainable development in the partner countries according to the Sustainable Development Goals[2]. Research partnerships are chosen by KEF members after an external scientific preliminary assessment, according to the KEF criteria of scientific quality, development political relevance and sustainability. Projects are carried out in countries which receive funds from the Official Development Assistance according to the OECD-DAC list. Climate change is among the relevant topics; the project database is available online (https://kef-research.at/en/projects/database/).

Research also plays a relevant role in some projects supported by the Austrian Development Cooperation, e.g. Central African countries on strengthening adaptation of semi-arid ecosystems or through our long-lasting cooperation with Bhutan focussing on increasing the resilience of mountain forests.

8.3 Systematic Observation

[2] https://sustainabledevelopment.un.org/?menu=1300

The Austrian GCOS coordination unit[3] has been established at the Central Institute for Meteorology and Geodynamics (ZAMG), which is the national meteorological service. The national GCOS report has been updated in 2017 and has been reported to WMO, see https://www.zamg.ac.at/cms/de/dokumente/topmenu/gcos/gcos-report-2017.

A selection of relevant observation parameters is listed below.

8.3.1 Atmospheric climate observing systems

Meteorological parameters:

- Due to the complex topography of the Alps general model-based findings on climate change have limited applicability in Austria, and monitoring requires a quite dense network of stations;
- the longest of Austria's instrumental time series of climate observations go back as far as to the 18th century and are among the longest that exist;
- due to the long experience with meteorological measurements, quality- and homogeneity control of the data are highly developed and long-time homogeneous datasets are available, like HISTALP[4] (historical instrumental climatological surface time series of the greater alpine region).
- more than 1000 stations are measuring at least temperature and precipitation, the majority of these stations is managed by the Hydrographic Service (Dept. VII/3 of the Federal Ministry of Agriculture, Forestry, Environment and Water Management in co-operation with the *Länder*);
- the network of the Central Institute for Meteorology and Geodynamics (ZAMG) comprises more than 250 stations, which gather a comprehensive set of meteorological data (air temperature, air pressure, wind speed and direction, water vapour, precipitation, relative humidity, sunshine duration), 150 of these stations are exchanged internationally within the WWW, 3 stations are part of GSN, about 53 full automatic weather stations (VAMES) in cooperation with the department of the air traffic service AUSTRO CONTROL;
- Austria's global GAW station is located at "Hoher Sonnblick"[5] at 3106 maSl:
    - high altitude meteorological observatory operating continuously since 1886, longest continuous and homogeneous meteorological time series for high altitudes worldwide;
    - monitoring site with little influence by human activities, which is rare in Europe;
    - has been growing to a monitoring and research station covering several scientific disciplines since the late 20th century (atmosphere composition, radiation, cryosphere, …);
- radiosonde data from the station at the ZAMG headquarter in Vienna is provided to GUAN.

Radiation measurement:

[3] See http://www.gcos.at
[4] http://www.zamg.ac.at/histalp/
[5] https://www.sonnblick.net/en

- Routine measurement is performed at the 250 meteorological stations of ZAMG;
- detailed and precise radiation data at the six monitoring stations of the Austrian Radiation Network ARAD, network started in 2010;
- ARAD station at Hoher Sonnblick is part of BSRN;
- Hoher Sonnblick and 6 other stations report data to the World Radiation Data Center;
- measurements of high-resolution spectral UV-radiation and stratospheric ozone at Hoher Sonnblick delivered to the NDACC;
- several broadband UV monitoring stations are distributed over Austria and provide the population with UV index information; their data are reported to WOUDC.

Atmospheric constituents:

- for purpose of air quality monitoring (focus on human health) data are collected at more than 120 stations (responsibility of the Federal Environment Agency and the *Länder*);
- time series from Hoher Sonnblick are available at the WDCGG (surface ozone measures since 1990 and CO and CO_2 since 1999, furthermore CH_4 and oxidised nitrogen compounds).

8.3.2 Terrestrial climate observing systems

Cryosphere:

- Glacier length measurements of approximately 100 glaciers are preformed continuously since the end of the 19th century;
- glacier mass balance measurements are currently performed at 12 glaciers, the earliest starting in the 1950ies;
- data reported internationally to WGMS/GTN-G;
- measurements of permafrost have started in recent years, 3 sites reporting to GTN-P.

Hydrosphere:

- Complex terrain of Austria requires an extensive network of measurement stations;
- 800 stations for the river discharge measurements and 3800 stations for the ground water storage in operation (Hydrographic Service);
- More than 1100 stations with precipitation and 800 with snow depth measurements (Hydrographic Service and ZAMG);
- River runoff data for about 60 stations have been delivered to GRDC.

Biosphere:

- Forest inventory data, including parameters like above-ground biomass, has been collected since the 1960ies;
- LTER network (as part of the ILTER network on “International Long Term Ecological Research”), 27 ILTER sites are established in Austria;
- Phenological observations are currently performed at about 100 sites, digitised time series date back to the early 20th century, data is available in the Paneuropean Phenological Database[6].

[6] http://www.pep725.eu/

8.3.3 Space-based observing programs

- Austrians space based activities are coordinated by the Austrian Space Agency, which is hosted in the Aeronautics and Space Agency (ALR) of the Austrian Research Promotion Agency (FFG);
- Austria is member of the European Space Agency (ESA) and of the European Meteorological Organisation EUMETSAT;
- The agency's main focus is on managing the contributions of the Republic of Austria to the programmes of the European Space Agency (ESA) and is responsible for the management of the Austrian Space Programme ASAP;
- Several ASAP projects have dealt with earth observation and climate change issues.

Chapter 9

Education, Training and Public Awareness

9.1 Education

Principles of instruction

- Environmental Education (EE) has been a *principle of instruction s*ince 1979;
- EE has been integrated into the curricula of general education and of the vocational school system;
- First *Ministerial Decree "Environmental Education in Schools"* in 1985 with main aims of action competence and experiencing of democratic attitudes and behaviour in order to enable the learners to be active in political life.
- Latest development is the *Decree on environmental education for sustainable development* from 2014[1];
- Openness of the term "Education for Sustainable Development" provides space for innovations like interdisciplinary projects, community co-operation of schools in Local Agenda 21 processes, participatory programmes and developments, as well as research-based learning and impulses for local curriculum development

Strategies

- Two objectives of the *Austrian National Strategy for Sustainable Development (2002)"* focus on education ("A Sustainable Life Style" and "Solutions through Education and Research");
- *Austrian Strategy for Education for Sustainable Development* was tabled by three ministries and passed the Austrian Council of Ministers on November 12, 2008;

Agricultural education, training and extension institutions

- contribute to Austrian efforts of stabilizing the earth's climate;
- guiding principle of socio-ecological agricultural policy;
- soil protecting, organic farming, biomass and biogas production are part of agricultural education and training programmes;
- Austrian agricultural education, training and extension institutions create public awareness on ecological topics.

Initiatives and Networks

Several specific institutions, initiatives and networks promote sustainable education and topics relevant for climate change. They are in general supported by federal ministries and/or *Länder*. Some important examples are listed below:

- *FORUM Umweltbildung (FORUM Environmental Education)*
  Since 1983, this organisation has been operating on behalf of both the Ministry of Education and the Ministry of Environment, developing and promoting educational programmes. FORUM Umweltbildung organises specific programmes, provides schools

[1] https://www.bmb.gv.at/ministerium/rs/2014_20_ge_umwelt_en.pdf?61edhe

with teaching materials and tools and offers workshops on relevant topics. Target group are educators in the formal and non-formal eductional sector. (http://www.umweltbildung.at/english/background.html)

- *ÖKOLOG – Österreichs größtes Netzwerk für Schule und Umwelt (Network for Schools and Environment)*
  ÖKOLOG is the first and main Austrian programme for schools at the interface of Environmental Education and School development. It is based on the approach of the International decentralised Network "Environment and School Initiatives/ENSI" to EE and ESD. Schools define ecological, technical and social conditions of their environment and, on the basis of these results, define objectives, targets and/or concrete activities and quality criteria, to be implemented and evaluated. The ÖKOLOG-programme is supported and supplemented at the Länder level with regional support teams in all provinces. More than 500 schools and 9 university colleges of teacher education participate in the network. Specific topics are supported by information material, in-service training and partly by local advising. (http://www.oekolog.at/welcome)
- *Umweltzeichen für Schulen und Bildungseinrichtungen (National Environmental Performance Award for Schools and Educational Institutions)*
  This is a national and government based award, its criteria were set in force by January 2002. About half of the 120 criteria relate to EE, school curriculum and school development. The other half refers to technical aspects like energy saving. The award is valid for four years after the obligatory external evaluation and has to be renewed afterwards.
  (https://www.umweltzeichen.at/cms/en/education/schools/content.html)
- *Schulen und Kindergärten im Klimabündnis (Climate Alliance Schools and Kindergartens)*
  540 schools and kindergartens in Austria participate in the network of Climate Alliance. These educational institutions take action in climate protection and deal with the topic of climate justice. Climate Alliance supports schools and kindergartens by teaching materials, workshops, puppet shows and campaigns.
  (http://www.klimabuendnis.at/schule-kiga)
- *BINE – Bildung für Nachhaltige Entwicklung (Education for Sustainable Developement)*
  ESD is a nation wide University study course for in-service training for teacher educators for ESD. The aim is to promote ESD in teacher education, to foster innovative didactics, to encourage exchanging experiences and methods and to help teacher educators develop research competencies.
  (https://ius.aau.at/en/bine-education-for-sustainable-development-innovation-in-teacher-education-structure-and-contents)
- *Hochschule für Agrar- und Umweltpädagogik Wien (University-level training institute for educational professions in agricultural and ecological affairs)*
  The University-level training institute for educational professions in agricultural and ecological affairs started operation in 2007. This institute is essentially supporting the development and dissemination of appropriate methods and practices of teaching, training and creation of awareness in ecological matters.
  (http://www.agrarumweltpaedagogik.ac.at/en/)
- *Climate protection issues in the Agricultural and Forestry Schools*
  These secondary schools, which offer a professional education regarding agriculture and forestry, are engaged in different projects related to climate change with indirect or direct involvement of students. Projects concern changes in the physical school environment (energy contracting for school buildings, ecological ways of construction for

buildings, installation of photovoltaic systems), awareness changes (ranging from acquisition of organic products for the school kitchens to integrated improvement processes in order to join the ÖKOLOG school network or to get awarded the Austrian eco-label for schools) as well as hands-on training (organic farming in school farms, eco-driving for tractors).

Valuable work is done by several NGOs such as the Climate Alliance Austria, WWF, Naturschutzbund, Umweltberatung, etc. Some of these NGOs, interest groups and communication agencies have organised project competitions, provided teaching materials, organised workshops for teachers or have acted as consultants. Expert lessons in schools or outdoors have been provided.

9.2 Training and Advising

General

- Training and advice on energy saving is provided by the Länder and Federation, partly in co-operation with other institutions like regional energy agencies[2]
- advice, support (and partial grants) for measures related to environmental protection and energy efficiency are offered to small and medium enterprises as well as to consumers;
- several stakeholders have taken their own initiatives, like the Austrian Biomass Association, which has established a certification-system for plumbers specialized in installing biomass-heating systems, and the Austrian Federal Economic Chamber, which founded the Business Energy Institute as a platform for facilitating implementation of energy efficiency measures for businesses;
- the Austrian Energy Agency provides consulting and advice for decision makers in politics, administration and business; it has been founded as a non-profit organisation 40 years ago by the Republic of Austria, the federal provinces, important energy supply and energy technology companies, interest groups, and scientific organisations. (https://en.energyagency.at/)

Klima*aktiv*

- Is the central initiative of the Federal Ministry of Agriculture and Forestry, Environment and Water Management since 2004;
- overall objective is to reduce energy consumption and to promote CO_2-neutral energy sources;
- four thematic clusters: Renewable energy, buildings, energy efficiency, mobility;
- target groups are companies, communities and private end-users;
- several specific programmes provide a comprehensive and systematic approach in supporting the market penetration of climate-friendly technologies, services and activities by training and advising measures and subsidies;

[2] e. g. https://www.enu.at/, http://www.energiesparverband.at/, https://www.salzburg.gv.at/themen/energie/energieberatung, https://portal.ea-stmk.at/, http://www.energie-tirol.at/, https://www.energieinstitut.at/

- klima*aktiv* provides targeted support for e.g. training of key players, for standard setting and quality management or for target-group specific information, motivation and marketing as well as building of networks.
- klima*aktiv* mobil programmes motivate and support stakeholders to develop and implement measures to reduce GHG in their transport and mobility activities;
- programmes in the area of mobility promote clean fuels and vehicles, fuel saving ("eco driving"), environmentally friendly transport modes, mobility management and improved transport efficiency

(https://www.klimaaktiv.at/english/, https://www.klimaaktiv.at/english/mobility.html)

Training for municipalities

- training courses have been developed by Climate Alliance; target groups are community representatives, mayors, regional and communal multipliers who can fall back on the emerging network of experts and participants.
- main focus lies on spreading knowledge about the actual situation of climate change and adaption as well as the presentation of good-practice inputs from experts of communities, university and experts in their fields;
- particular attention is paid to stimulate the creativity of participants to develop their own climate protection projects for their region or town
- Climate Alliance also offers specific trainings on the topics sustainable mobility and land use planning & soil protection, which should enable participants to develop projects in their community.

Agriculture

- the chambers of agriculture (LKÖ), the Rural Adult Education Institutes (LFI), Bio Austria and the Austrian Council for Agricultural Engineering and Rural Development (ÖKL) are important institutions for extension related to climate protection issues;
- agricultural extension and further training for adult farmers comprise the series of topics with regard to climate protection, ranging from the Austrian agri-environmental programme ÖPUL (e.g. reduced utilisation of nitrogen and nutrient balance) and organic farming to energy efficiency and renewable energy sources.

9.3 Public Awareness

General

- According to surveys of the last decade, climate change is the most important environmental problem for the Austrian population;
- awareness programmes at federal, *Länder* and municipal level take account of these concerns and inform about everyone's possibilities to take part in the fight against climate change;
- awareness measures comprise print (brochures, magazines), information and advertisements in media (newspapers, TV) as well as websites[3];

[3] e. g. http://www.ktn.gv.at/320015_DE%2dktn%2egv%2eat%2dKlimaschutz, http://www.klimarettung.at/, http://www.ich-tus.steiermark.at/, http://www.klimaschutz-tirol.at/, https://www.energieautonomie-vorarlberg.at/de/, https://klimaschlau.wien.gv.at/site/

Programmes, initiatives

- Programmes like klima*aktiv* cover aspects of training and advising as well as aspects of public awareness; for example klima*aktiv* mobil supports the Austrian national cycling strategy by awareness campaigns and awards in parallel to support for infrastructure improvements and consulting and advice for stakeholders;
- public information and awareness plays an important role with respect to the advantages of organic farming and its products; information is published by the Federal Ministry of Agriculture, Forestry, Environment and Water Management as well as by Agrarmarkt Austria GmbH and by the joint platform of the associations for organic farmers, "BIO AUSTRIA";
- the European Carfree Day and the European Mobility Week is an international initiative fostering awareness for pollution free mobility; in 2017 more than 500 Austrian communities did take part in these activites, which is the highest participation of all countries (http://www.mobilityweek.eu)
- the Energy Globe Award is a competition for initiatives in the fields of (a. o.) energy efficiency and renewable energy sources since 1999; the Austrian competitions take place annually at the level of the *Länder* as well as on national level; on international level 2000 projects from 178 countries were submitted in 2017 for this environmental award, which is organized by the Energy Globe Foundation based in Austria (http://www.energyglobe.info).

NGOs

- Environmental NGOs, organised in the umbrella organisations *Ökobüro* and *Umweltdachverband*, contribute to public awareness on climate change issues by various activities, covering articles in their members' magazines and specific public campaigns, information brochures and scientific studies, practical tools and GHG mitigation tips and many more activities;
- ENGOs' sources of finance are usually membership fees and donations; in some cases public subsidies are granted for definite projects.

Climate Alliance

The *Climate Alliance* is a NGO with climate change and climate justice as its main topics. It was founded in 1990 in Frankfurth am Main and is a global partnership for climate protection, set up by more than 1700 European municipalities and the Indigenous Peoples of the rainforest in the Amazon Basin. In Austria more than 960 municipalities and all *Länder*, more than 1120 private companies and more than 540 educational institutions have joined the Alliance. As a very successful non-profit organisation – with respect to raising public awareness for climate change issues as well as stimulating counter measures at the local level – it is supported by the members as well as by the Federal Ministry for Agriculture and Forestry, Environment and Water Management.

Members have committed themselves

- to cut CO_2 emissions by 10% every five years (i.e. halve per capita emissions by 2030 from 1990 levels), and
- to support the indigenous partners in Amazonia in preserving their culture, their way of life and the rainforest

In almost all member municipalities, working groups dealing with the implementation of measures in different areas (energy, transport, procurement, etc.) have been established. The success of these working groups is usually based on the involvement of committed citizens and local NGOs.

Many and diverse activities were undertaken by Climate Alliance Austria in the last years. These range from nation-wide competitions to regional seminars:

- A yearly nation-wide Climate Alliance meeting allows intensive discussion and exchange of opinions among the member municipalities. The meetings consist of presentations and excursions; several hundred municipalities have taken part in recent years.
- From 16 to 22 September thousands of European towns and cities participate in the European Mobility Week (EMW) and invite their citizens to a wide range of activities promoting sustainable mobility. In Austria Climate Alliance Austria coordinates this initiative.
- Information on different subjects of climate protection was offered at about 250 local seminars and regional meetings.
- A periodical, issued four times a year, informs the members and public about current activities and serves as project exchange for the members.
- Since 2002 the “Kids in the Move Campaign” invites children all over Europe to make their daily journeys independently and in a climate-friendly way. By collecting so-called Green Footprints all over Europe, the children show the "big ones", what the "small ones" do to protect the global climate. In 2017 more than 200.000 children and young people from 10 European countries took part and collected more than 2.3 million Green Footprints. In Austria Climate Alliance Austria coordinates this campaign (“Klimameilen-Kampagne”).
- Information campaigns have been realised on special topics such as the advantages of organic farming, the ban of HCFCs and HFCs in municipal procurement and on fair trade. Sustainable mobility, adapting to climate change and the announcement of the SDGs were on the agenda too.
- The campaign for climate protection includes the business sector, too. After initial analysis and advice by the Climate Alliance, companies commit themselves to energy saving measures and to a CO_2-reduction target. The performance with respect to the targets is evaluated regularly. Currently about 1120 companies have joined Climate Alliance Austria.

Partnership with indigenous rainforest peoples

An important part of the activities of the Climate Alliance is the *partnership with indigenous rainforest peoples* and raising awareness for these issues in Austria. Representatives of indigenous peoples have visited Austrian municipalities and vice versa. Austria has contributed to the protection of the global climate system with a programme for sustainable development in the “Alto Rio Negro” region since 1993. The Alto Rio Negro is a tributary of the Amazon in the North-West of Brazil. In this region 23 indigenous peoples have joined together into the umbrella organisation FOIRN. Climate Alliance Austria supports the FOIRN in their efforts for economic and cultural autonomy and in preserving the tropical rainforests, these being the very basis of their existence, by granting them title of ownership and ensuring the sustainable use of their territories. The main principle is the integration of native people in measures for the protection of their environment. Thanks to the support on

communal, regional and federal level an area of 10 million hectare of rain forest has been declared as indigenous territory. This prepares the ground for many initiatives and projects of the indigenous peoples in the Rio Negro region.

Appendix A

Indicators

Indicators pursuant to Annex III of the EU Greenhouse Gas Monitoring Regulation ((EU) No 525/2013).

Please note that for the road transport indicators activity data has been adjusted to reflect also the transport activity abroad, driven by fuel sold in Austria but consumed abroad. Activity data used for the calculation is therefore higher than those shown in Chapter 2.

Table A.1 Priority indicators

	Indicator	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015
1	Total CO2 intensity of GDP [t CO2/Mio Euro] (Total CO2 emissions excl. LULUCF, GDP 2010 prices)	320	294	261	287	246	232	222	222	209	215
2	Energy related CO2 intensity of GDP [t CO2/Mio Euro] (CRF 1A, GDP 2010 prices)	263	242	213	238	198	185	177	176	163	167
3	Specific CO2 emissions of passenger cars [g CO2/ km]	203	197	193	187	172	170	168	168	167	166
4	Energy related CO2 intensity of industry [t/Mio Euro] (CRF 1A2, GVA 2010 prices)	288	268	231	244	235	221	215	211	197	198
5	Specific CO2 emissions of households [t CO2/dwelling] (CRF 1A4b)	3.40	3.17	2.76	2.22	1.95	1.67	1.71	1.70	1.41	1.52
6	CO2 intensity of the commercial and institutional sector [t CO2/Mio Euro] (CRF 1A4a, GVA 2010 prices)	22.8	25.8	20.6	27.7	16.5	13.0	10.5	10.2	11.3	9.9
7	Specific CO2 emissions of public and autoproducer power plants [t CO2/TJ] (Power and CHP plants, electricity and heat output)	167	151	129	125	102	105	101	106	107	102

Table A.2 Additional priority indicators

	Indicator	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015
1	Specific CO2 emissions of road freight transport [g CO2/ ton-km]	110	95	79	74	68	68	68	64	64	63
2	Total CO2 intensity – iron and steel industry [t CO2/Mio Euro] (CRF 1A2a & 2C1 & 2C2, GVA 2010 prices)	2304	1819	1453	1948	3448	3470	3101	3331	3233	3202
3	Energy related CO2 intensity – chemical industry [t CO2/Mio Euro] (CRF 1A2c, GVA 2010 prices))	566	433	404	424	438	395	369	337	314	319
4	Energy related CO2 intensity – glass, pottery and building materials industry [t CO2/Mio Euro] (CRF 1A2f, GVA 2010 prices)	607	561	524	549	624	621	633	625	635	638
5	Specific CO2 emissions of iron and steel industry [t CO2/t production] (CRF 1A2a & 2C1 & 2C2, oxygen steel produced)	2.22	1.97	1.87	1.82	1.78	1.75	1.71	1.66	1.65	1.74
6	Specific energy related CO2 emissions of cement industry [t CO2/t production] (CRF 1A2f, cement produced)	0.36	0.40	0.38	0.36	0.36	0.35	0.34	0.35	0.36	0.35

Table A.3 Supplementary indicators

	Indicator	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015
1	Specific diesel related CO2 emissions of passenger cars [g CO2/ km]	186	184	182	179	169	168	167	167	166	165
2	Specific petrol related CO2 emissions of passenger cars [g CO2/ km]	206	201	199	195	173	171	168	167	166	165
3	Specific emissions of passenger transport on road [g CO2/passenger-km]	149	152	157	157	147	146	145	145	144	144
4	Domestic passenger transport by air [kg CO2/passenger]	234	226	126	111	82	93	86	86	86	93
5	Energy related CO2 intensity – food, drink and tobacco industry [t CO2/Mio Euro] (CRF 1A2e, GVA 2010 prices)	181	165	156	161	154	160	155	154	151	163
6	Energy related CO2 intensity – paper and printing industry [t CO2/Mio Euro] (CRF 1A2d, GVA 2010 prices)	893	852	689	619	621	573	509	478	418	444
7	Specific CO2 emissions of households for space heating [kg CO2/m²] (surface area of permanently occupied dwellings)	33.3	29.8	25.1	19.6	16.7	14.2	14.6	14.3	11.7	12.8
9	Specific CO2 emissions of public power plants [t CO2/TJ] (Power and CHP plants, electricity and heat output)	166	144	133	115	85	88	84	82	77	79
10	Specific CO2 emissions of autoproducer power plants [t CO2/TJ] (Power and CHP plants, electricity and heat output)	168	169	117	161	153	153	142	155	165	152
11	Carbon intensity of total power generation [t CO2/TJ] (electricity and heat output including production from renewable sources)	68.4	59.1	48.1	59.4	50.2	52.6	42.3	42.2	39.2	42.3
12	Carbon intensity of transport [t CO2/TJ] (CRF 1A3, final energy consumption)	66.0	64.1	63.7	65.3	60.5	60.1	60.5	61.1	60.0	59.3
13	Specific energy related CO2 emissions of paper industry [t CO2/t production] (CRF 1A2d, paper produced)	0.76	0.64	0.54	0.46	0.47	0.47	0.41	0.40	0.36	0.37
14	Carbon intensity in Industry [kt CO2 /PJ] (CRF 1A2, total final energy consumption)	45.8	46.4	39.9	39.3	35.6	35.3	35.2	34.4	33.1	32.8
15	Carbon intensity Households [kt CO2 /PJ] (CRF 1A4b, final energy consumption)	40.9	37.5	34.9	29.9	26.7	24.8	24.7	23.2	22.3	22.7

Appendix B

Greenhouse Gas Inventory Information – Tables

CRF Tables from Austria's inventory submission April 2017

CRF Table10s1

GREENHOUSE GAS SOURCE AND SINK CATEGO	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
	(kt CO_2 eq)									
Total (net emissions)[2]	66666.02	65851.42	64098.37	63783.20	64392.17	66410.41	72179.15	63266.49	64428.02	60679.26
1. Energy	53027.67	56724.75	52137.54	52394.83	52038.93	54520.01	58721.70	57218.94	57020.90	55847.12
A. Fuel combustion (sectoral approach)	52325.86	56155.65	51525.53	51814.41	51568.60	54055.98	58330.07	56782.67	56557.30	55350.78
1. Energy industries	13838.23	14672.01	11356.15	11506.06	11803.76	12965.23	13857.33	13929.58	13052.75	12590.32
2. Manufacturing industries and construction	9889.48	10246.17	9471.08	9689.90	10435.00	10336.00	10969.41	11960.35	10571.17	9810.59
3. Transport	13975.92	15456.96	15426.80	15558.39	15606.46	15886.81	17440.40	16452.79	18561.30	18022.50
4. Other sectors	14586.35	15742.53	15236.96	15019.68	13680.82	14834.55	16023.07	14401.97	14328.71	14884.85
5. Other	35.87	37.99	34.53	40.38	42.56	33.39	39.85	37.98	43.37	42.52
B. Fugitive emissions from fuels	701.81	569.10	612.01	580.42	470.33	464.03	391.64	436.27	463.60	496.35
1. Solid fuels	333.22	181.14	192.32	164.36	56.38	36.84	24.13	24.61	24.83	24.77
2. Oil and natural gas and other	368.59	387.97	419.69	416.06	413.95	427.19	367.51	411.66	438.78	471.58
C. CO_2 transport and storage	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2. Industrial Processes	13663.04	13696.32	12054.17	12004.75	12739.49	13605.67	13057.24	14220.14	13865.42	13647.28
A. Mineral industry	3092.46	2950.10	2990.49	2925.54	3026.70	2657.39	2594.10	2765.48	2602.40	2606.43
B. Chemical industry	1555.31	1591.03	1471.18	1552.59	1459.59	1528.06	1552.14	1533.65	1560.41	1591.41
C. Metal industry	8177.44	8210.89	6599.67	6258.66	6876.62	7842.13	7349.02	8072.09	7858.37	7553.56
D. Non-energy products from fuels and solvent use	348.94	323.39	295.40	266.15	249.75	233.95	238.74	241.00	233.99	228.87
E. Electronic industry	133.87	214.92	286.95	358.97	429.37	509.61	413.68	610.33	479.34	460.23
F. Product uses as ODS substitutes	NO	NO	0.02	227.91	252.02	342.66	404.88	486.21	604.80	696.84
G. Other product manufacture and use	355.03	405.99	410.46	414.92	445.43	491.86	504.68	511.40	526.12	509.94
H. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3. Agriculture	8188.91	8215.46	7786.47	7647.10	7899.66	8038.15	7789.59	7740.53	7708.47	7601.56
A. Enteric fermentation	4820.53	4749.17	4550.32	4547.37	4552.90	4638.25	4563.33	4481.74	4447.96	4410.82
B. Manure management	1025.28	1015.58	989.24	996.02	993.27	1010.01	993.21	980.91	979.13	952.77
C. Rice cultivation	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
D. Agricultural soils	2247.02	2351.79	2148.00	2005.62	2253.91	2288.48	2131.34	2175.53	2178.25	2135.08
E. Prescribed burning of savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Field burning of agricultural residues	1.66	1.62	1.64	1.50	1.61	1.61	1.53	1.59	1.56	1.60
G. Liming	89.97	91.06	91.09	90.81	91.39	91.85	92.49	92.08	91.45	90.87
H. Urea application	4.45	6.23	6.17	5.79	6.60	7.95	7.70	8.67	10.12	10.41
I. Other carbon-containing fertilizers	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
J. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4. Land use, land-use change and forestry[2]	-12138.63	-16779.42	-11826.21	-12184.47	-12109.07	-13404.57	-10852.07	-19227.96	-17361.64	-19491.98
A. Forest land	-10861.51	-16589.01	-11822.91	-12292.91	-11231.48	-12215.88	-9200.39	-17955.51	-16143.89	-19063.32
B. Cropland	161.79	161.89	155.62	151.69	162.30	34.26	51.93	69.20	85.18	88.66
C. Grassland	651.20	645.94	640.85	635.88	635.90	468.84	470.61	472.14	473.87	473.63
D. Wetlands	42.08	42.03	41.97	41.93	41.93	30.31	35.81	35.81	35.81	35.80
E. Settlements	649.07	651.15	653.53	655.98	651.43	594.24	587.44	580.64	573.85	570.48
F. Other land	457.03	467.30	477.55	487.93	488.16	389.99	385.93	381.87	377.83	378.78
G. Harvested wood products	-3252.93	-2173.59	-1987.90	-1880.27	-2872.42	-2721.12	-3197.88	-2826.27	-2778.12	-1989.75
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
5. Waste	3925.02	3994.31	3946.41	3920.98	3823.16	3651.16	3462.69	3314.84	3194.88	3075.28
A. Solid waste disposal	3643.89	3714.20	3674.26	3640.75	3531.84	3355.11	3166.08	3023.65	2905.19	2783.70
B. Biological treatment of solid waste	35.74	37.47	44.43	55.09	65.39	69.09	72.49	71.32	73.90	77.72
C. Incineration and open burning of waste	28.07	24.50	11.18	10.84	10.82	11.15	11.47	11.79	12.12	12.44
D. Waste water treatment and discharge	217.32	218.14	216.55	214.30	215.11	215.81	212.65	208.08	203.67	201.42
E. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
6. Other ***(as specified in summary 1.A)***	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Memo items:										
International bunkers	950.23	1052.16	1135.44	1199.99	1259.10	1410.04	1552.22	1610.25	1669.78	1632.05
Aviation	895.54	1004.59	1089.17	1152.46	1198.63	1341.95	1482.42	1542.14	1595.37	1558.47
Navigation	54.68	47.57	46.26	47.53	60.47	68.09	69.80	68.11	74.41	73.59
Multilateral operations	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
CO_2 emissions from biomass	10420.76	11391.32	11098.36	11635.76	11184.96	11883.33	12686.37	12154.32	11857.27	13593.46
CO_2 captured	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Long-term storage of C in waste disposal sites	22778.82	23458.60	24066.57	24662.12	25119.30	25543.19	25970.84	26378.02	26788.92	27198.55
Indirect N_2O	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA
Indirect CO_2[3]	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA
Total CO_2 eq without LULUCF	78804.65	82630.84	75924.58	75967.67	76501.24	79814.98	83031.22	82494.45	81789.67	80171.24
Total $CO_{2\ eq}$ with LULUCF	66666.02	65851.42	64098.37	63783.20	64392.17	66410.41	72179.15	63266.49	64428.02	60679.26
Total CO_2 eq. incl. indirect CO2, w/o LULUCF	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total CO_2 eq incl. indirect CO2, w LULUCF	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

CRF Table10s1 continued

GREENHOUSE GAS SOURCE AND SINK CATE	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
	(kt CO_2 eq)									
Total (net emissions)[2]	64306.92	65428.22	71950.76	87005.24	82409.48	81908.82	84416.76	81349.05	82401.80	75853.00
1. Energy	55421.96	59746.49	60884.97	66544.49	66710.53	67134.34	63798.13	60470.06	59992.46	56770.71
A. Fuel combustion (sectoral approach)	54925.49	59231.88	60386.13	65979.89	66199.61	66652.04	63280.87	59945.88	59510.11	56230.21
1. Energy industries	12313.91	13900.01	13498.04	16090.54	16060.48	16239.62	15080.08	13802.02	13629.09	12612.18
2. Manufacturing industries and construction	10080.54	10169.45	10604.87	11026.11	11266.70	11795.15	11415.19	11068.44	11460.74	10946.96
3. Transport	18818.30	20309.15	22221.80	24074.48	24590.14	24933.73	23626.46	23829.46	22406.98	21726.21
4. Other sectors	13670.94	14810.90	14018.49	14745.27	14238.24	13638.96	13114.07	11200.35	11967.13	10898.16
5. Other	41.80	42.37	42.93	43.49	44.04	44.58	45.06	45.62	46.17	46.69
B. Fugitive emissions from fuels	496.47	514.60	498.84	564.60	510.93	482.30	517.26	524.18	482.35	540.50
1. Solid fuels	27.19	26.25	30.74	25.09	5.13	0.13	0.15	NO,NA	NO,NA	NO,NA
2. Oil and natural gas and other	469.28	488.35	468.10	539.51	505.80	482.17	517.12	524.18	482.35	540.50
C. CO_2 transport and storage	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2. Industrial Processes	14642.04	14523.42	15166.23	15307.79	14863.46	15612.47	16251.69	16940.67	17273.78	13948.38
A. Mineral industry	2733.20	2758.67	2842.66	2829.34	2915.62	2888.79	3053.33	3265.67	3276.09	2714.92
B. Chemical industry	1623.74	1418.85	1448.39	1558.95	972.93	943.33	983.43	908.74	1011.98	792.93
C. Metal industry	8482.76	8315.24	8774.64	8748.48	8761.68	9576.79	10049.47	10546.86	10740.63	8403.23
D. Non-energy products from fuels and solvent use	227.74	226.64	211.99	215.35	208.57	210.02	206.43	207.24	202.44	195.82
E. Electronic industry	419.96	474.82	459.47	513.53	552.11	352.34	370.08	391.05	370.94	113.86
F. Product uses as ODS substitutes	708.85	857.49	963.67	1067.28	1153.21	1140.73	1146.10	1186.95	1239.19	1306.61
G. Other product manufacture and use	445.80	471.71	465.42	374.87	299.35	500.48	442.84	434.16	432.51	421.01
H. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3. Agriculture	7506.43	7448.97	7336.49	7188.72	7170.01	7103.85	7077.16	7118.30	7225.72	7244.78
A. Enteric fermentation	4386.67	4326.99	4239.51	4196.41	4197.94	4146.58	4134.62	4151.50	4145.31	4199.70
B. Manure management	942.49	939.23	918.37	908.17	900.09	896.20	892.99	901.45	891.03	903.18
C. Rice cultivation	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
D. Agricultural soils	2077.26	2085.44	2080.90	1984.00	1967.84	1956.74	1943.51	1957.05	2083.21	2030.70
E. Prescribed burning of savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Field burning of agricultural residues	1.45	1.58	1.51	1.43	2.13	1.38	1.29	1.33	1.28	1.20
G. Liming	90.19	90.10	90.06	90.09	91.17	91.19	89.85	89.05	88.33	88.03
H. Urea application	8.37	5.64	6.13	8.62	10.84	11.76	14.91	17.92	16.55	21.97
I. Other carbon-containing fertilizers	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
J. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4. Land use, land-use change and forestry[2]	-16226.62	-19156.15	-14300.04	-4902.35	-9264.47	-10732.83	-5381.43	-5723.31	-4521.27	-4395.60
A. Forest land	-15974.73	-17927.73	-12233.29	-2241.13	-7322.50	-8773.71	-2958.60	-1930.52	-1035.80	-4473.84
B. Cropland	83.85	-107.23	-73.46	-98.10	-124.66	-140.62	-122.97	-245.35	-221.46	-234.44
C. Grassland	473.28	472.90	680.68	678.31	678.44	680.11	680.16	682.33	675.70	380.53
D. Wetlands	35.80	35.80	47.28	47.27	47.30	47.33	37.20	39.34	51.32	68.13
E. Settlements	567.12	563.75	644.04	643.21	640.73	636.63	632.38	606.75	641.92	548.57
F. Other land	379.73	380.69	349.54	350.56	341.82	333.09	324.40	315.72	307.04	221.93
G. Harvested wood products	-1805.30	-2587.85	-3728.28	-4295.88	-3538.91	-3528.89	-3987.22	-5204.80	-4953.32	-919.86
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
5. Waste	2963.11	2865.49	2863.10	2866.58	2929.96	2790.99	2671.21	2543.33	2431.10	2284.73
A. Solid waste disposal	2666.85	2557.98	2548.89	2545.14	2586.65	2437.75	2313.67	2183.94	2073.57	1929.05
B. Biological treatment of solid waste	82.59	93.92	105.27	116.77	140.96	151.36	157.38	162.50	163.90	164.89
C. Incineration and open burning of waste	12.44	12.44	12.44	12.44	12.44	12.44	10.29	8.23	6.18	4.12
D. Waste water treatment and discharge	201.23	201.15	196.50	192.23	189.91	189.44	189.86	188.66	187.46	186.66
E. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
6. Other ***(as specified in summary 1.A)***	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Memo items:										
International bunkers	1793.48	1753.52	1652.39	1544.34	1833.75	2069.35	2148.12	2281.79	2281.45	1978.58
Aviation	1713.23	1668.65	1556.93	1468.22	1742.86	1980.31	2070.31	2198.56	2204.85	1913.35
Navigation	80.26	84.87	95.47	76.12	90.89	89.04	77.81	83.23	76.60	65.23
Multilateral operations	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
CO_2 emissions from biomass	12758.15	13938.61	12902.53	13355.77	13478.80	15790.27	17046.93	18673.49	19945.08	20412.05
CO_2 captured	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Long-term storage of C in waste disposal sites	27613.89	28032.24	28492.82	29026.56	29181.14	29341.30	29517.62	29678.61	29794.49	29861.73
Indirect N_2O	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA
Indirect CO_2 [3]	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA
Total CO_2 eq without LULUCF	80533.54	84584.37	86250.80	91907.59	91673.96	92641.65	89798.19	87072.36	86923.07	80248.60
Total $CO_{2\,eq}$ with LULUCF	64306.92	65428.22	71950.76	87005.24	82409.48	81908.82	84416.76	81349.05	82401.80	75853.00
Total CO_2 eq. incl. indirect CO2, w/o LULUCF	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total CO_2 eq incl. indirect CO2, w LULUCF	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

CRF Table10s1 continued

GREENHOUSE GAS SOURCE AND SINK CATEGO	2010	2011	2012	2013	2014	2015	Change from base to latest reported year
	(kt CO_2 eq)						%
Total (net emissions)[2]	79171.92	76509.92	74404.87	75636.80	71495.84	74027.14	11.04
1. Energy	59880.50	57423.56	55321.00	55284.55	51325.78	53350.86	0.61
A. Fuel combustion (sectoral approach)	59359.02	56908.85	54792.89	54752.76	50835.13	52873.93	1.05
1. Energy industries	13988.45	13795.23	12384.79	11330.26	9650.96	10927.52	-21.03
2. Manufacturing industries and construction	11543.45	11476.46	11254.88	11110.33	10395.12	10467.17	5.84
3. Transport	22529.36	21875.66	21660.86	22820.21	22179.36	22587.47	61.62
4. Other sectors	11250.51	9713.68	9443.98	9443.00	8560.18	8841.70	-39.38
5. Other	47.26	47.82	48.38	48.96	49.51	50.07	39.58
B. Fugitive emissions from fuels	521.48	514.71	528.11	531.80	490.65	476.93	-32.04
1. Solid fuels	NO,NA	NO,NA	NO,NA	NO,NA	NA,NO	NO,NA	
2. Oil and natural gas and other	521.48	514.71	528.11	531.80	490.65	476.93	29.39
C. CO_2 transport and storage	NO	NO	NO	NO	NO	NO	0.00
2. Industrial Processes	15926.15	16084.57	15697.25	15978.01	16133.37	16676.38	22.05
A. Mineral industry	2660.68	2779.36	2703.56	2719.69	2721.94	2739.63	-11.41
B. Chemical industry	784.46	785.62	759.54	696.58	810.37	793.56	-48.98
C. Metal industry	10227.41	10245.97	9901.54	10261.45	10255.71	10772.10	31.73
D. Non-energy products from fuels and solvent use	192.92	195.72	200.11	181.81	181.98	179.01	-48.70
E. Electronic industry	149.77	119.16	101.25	90.35	96.94	107.05	-20.04
F. Product uses as ODS substitutes	1481.40	1534.02	1610.66	1600.77	1641.18	1659.68	100.00
G. Other product manufacture and use	429.50	424.71	420.58	427.36	425.25	425.36	19.81
H. Other	NA	NA	NA	NA	NA	NA	0.00
3. Agriculture	7094.42	7146.13	7077.38	7059.12	7183.51	7167.99	-12.47
A. Enteric fermentation	4189.65	4137.41	4110.16	4117.37	4136.34	4130.84	-14.31
B. Manure management	900.51	887.25	879.69	877.81	878.24	876.88	-14.47
C. Rice cultivation	NO	NO	NO	NO	NO	NO	0.00
D. Agricultural soils	1895.88	2014.97	1978.40	1955.41	2056.88	2050.35	-8.75
E. Prescribed burning of savannas	NO	NO	NO	NO	NO	NO	0.00
F. Field burning of agricultural residues	1.15	0.91	0.72	0.67	0.73	0.65	-60.63
G. Liming	87.68	87.24	86.73	86.36	85.87	85.66	-4.80
H. Urea application	19.56	18.36	21.69	21.51	25.44	23.61	430.44
I. Other carbon-containing fertilizers	NA	NA	NA	NA	NA	NA	0.00
J. Other	NA	NA	NA	NA	NA	NA	0.00
4. Land use, land-use change and forestry[2]	-5887.10	-6186.97	-5633.06	-4513.44	-4885.49	-4823.67	-60.26
A. Forest land	-4441.05	-4408.26	-4375.40	-4342.26	-4309.39	-4301.82	-60.39
B. Cropland	-249.91	-257.36	-253.92	-232.69	-190.60	-11.69	-107.23
C. Grassland	379.39	382.19	378.86	381.55	381.58	397.42	-38.97
D. Wetlands	68.79	73.41	69.78	101.17	71.05	58.52	39.06
E. Settlements	521.03	501.28	512.18	468.96	472.56	442.23	-31.87
F. Other land	213.76	205.58	197.40	189.35	181.30	177.39	-61.19
G. Harvested wood products	-2392.49	-2697.15	-2175.35	-1092.83	-1505.29	-1599.20	-50.84
H. Other	NO	NO	NO	NO	NO	NO	0.00
5. Waste	2157.95	2042.63	1942.30	1828.55	1738.67	1655.58	-57.82
A. Solid waste disposal	1802.59	1686.17	1582.61	1477.08	1381.71	1293.94	-64.49
B. Biological treatment of solid waste	167.44	169.62	173.73	166.28	172.25	175.15	390.06
C. Incineration and open burning of waste	2.06	2.06	2.06	2.06	2.06	2.06	-92.67
D. Waste water treatment and discharge	185.87	184.79	183.90	183.13	182.65	184.43	-15.13
E. Other	NO	NO	NO	NO	NO	NO	0.00
6. Other ***(as specified in summary 1.A)***	NO	NO	NO	NO	NO	NO	0.00
Memo items:							
International bunkers	2148.06	2259.09	2163.98	2070.74	2066.86	2206.88	132.25
Aviation	2071.02	2191.30	2094.55	1996.28	1997.57	2149.68	140.04
Navigation	77.04	67.79	69.43	74.46	69.29	57.20	4.61
Multilateral operations	NO	NO	NO	NO	NO	NO	0.00
CO_2 emissions from biomass	23021.95	22403.35	23425.07	24468.61	22200.67	23378.08	124.34
CO_2 captured	NO	NO	NO	NO	NO	NO	0.00
Long-term storage of C in waste disposal sites	29926.26	29998.18	30041.79	30089.86	30135.39	30170.22	32.45
Indirect N_2O	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	0.00
Indirect CO_2 [3]	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	0.00
Total CO_2 eq without LULUCF	85059.02	82696.89	80037.93	80150.24	76381.33	78850.81	0.06
Total $CO_{2\,eq}$ with LULUCF	79171.92	76509.92	74404.87	75636.80	71495.84	74027.14	11.04
Total CO_2 eq. incl. indirect CO2, w/o LULUCF	NA	NA	NA	NA	NA	NA	0.00
Total CO_2 eq incl. indirect CO2, w LULUCF	NA	NA	NA	NA	NA	NA	0.00

CRF Table10s2

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
	(kt)									
1. Energy	51298.74	55042.86	50504.70	50822.25	50653.87	53115.56	57286.17	55926.81	55740.53	54551.94
A. Fuel combustion (sectoral approach)	51196.58	54931.69	50384.49	50710.05	50526.16	52988.35	57214.96	55806.11	55598.51	54381.22
1. Energy industries	13791.07	14618.97	11315.15	11466.16	11762.61	12918.37	13803.87	13873.55	13001.95	12541.02
2. Manufacturing industries and construction	9807.12	10155.64	9378.66	9592.49	10335.11	10233.20	10854.58	11845.85	10452.03	9679.04
3. Transport	13777.19	15240.69	15216.05	15352.03	15402.73	15686.02	17247.47	16270.98	18372.14	17846.16
4. Other sectors	13786.20	14879.30	14440.96	14259.96	12984.15	14118.20	15270.15	13778.65	13730.00	14273.43
5. Other	35.00	37.09	33.67	39.41	41.56	32.55	38.89	37.08	42.39	41.57
B. Fugitive emissions from fuels	102.16	111.16	120.21	112.20	127.71	127.22	71.22	120.70	142.01	170.72
1. Solid fuels	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA
2. Oil and natural gas and other	102.16	111.16	120.21	112.20	127.71	127.22	71.22	120.70	142.01	170.72
C. CO_2 transport and storage	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2. Industrial processes	10871.89	10735.91	9819.12	9858.84	10428.45	10980.22	10276.22	11414.81	11200.69	11036.54
A. Mineral industry	3092.46	2950.10	2990.49	2925.54	3026.70	2657.39	2594.10	2765.48	2602.40	2606.43
B. Chemical industry	643.49	664.77	632.02	672.97	631.05	669.46	676.90	669.36	662.56	668.88
C. Metal industry	6787.00	6797.65	5901.21	5994.18	6520.94	7419.42	6766.48	7738.98	7701.73	7532.36
D. Non-energy products from fuels and solvent use	348.94	323.39	295.40	266.15	249.75	233.95	238.74	241.00	233.99	228.87
E. Electronic industry										
F. Product uses as ODS substitutes										
G. Other product manufacture and use	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
H. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3. Agriculture	94.42	97.29	97.25	96.60	97.98	99.80	100.19	100.76	101.57	101.28
A. Enteric fermentation										
B. Manure management										
C. Rice cultivation										
D. Agricultural soils										
E. Prescribed burning of savannas										
F. Field burning of agricultural residues										
G. Liming	89.97	91.06	91.09	90.81	91.39	91.85	92.49	92.08	91.45	90.87
H. Urea application	4.45	6.23	6.17	5.79	6.60	7.95	7.70	8.67	10.12	10.41
I. Other carbon-containing fertilizers	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
J. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4. Land use, land-use change and forestry [(2)]	-12306.62	-16949.00	-11998.35	-12358.79	-12281.08	-13573.37	-11017.74	-19390.49	-17521.36	-19650.37
A. Forest land	-10892.46	-16620.49	-11855.80	-12326.82	-11263.82	-12246.33	-9229.03	-17982.33	-16169.20	-19087.67
B. Cropland	147.92	148.04	141.77	137.84	148.51	20.56	38.32	55.68	71.73	75.24
C. Grassland	627.41	622.15	617.07	612.09	612.12	445.05	446.83	448.36	450.09	449.84
D. Wetlands	42.08	42.03	41.97	41.93	41.93	30.31	35.81	35.81	35.81	35.80
E. Settlements	577.08	578.98	581.11	583.30	579.25	522.72	516.58	510.44	504.30	501.23
F. Other land	444.28	453.87	463.44	473.13	473.35	375.43	371.63	367.83	364.03	364.92
G. Harvested wood products	-3252.93	-2173.59	-1987.90	-1880.27	-2872.42	-2721.12	-3197.88	-2826.27	-2778.12	-1989.75
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
5. Waste	27.92	24.36	11.13	10.80	10.79	11.11	11.43	11.76	12.08	12.40
A. Solid waste disposal	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA
B. Biological treatment of solid waste										
C. Incineration and open burning of waste	27.92	24.36	11.13	10.80	10.79	11.11	11.43	11.76	12.08	12.40
D. Waste water treatment and discharge										
E. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
6. Other *(as specified in summary 1.A)*	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Memo items:										
International bunkers	935.45	1036.93	1119.30	1182.99	1240.34	1388.98	1529.50	1587.09	1645.40	1608.08
Aviation	885.97	993.88	1077.44	1139.98	1185.65	1327.42	1466.42	1525.57	1578.21	1541.67
Navigation	49.48	43.05	41.86	43.00	54.69	61.55	63.08	61.52	67.18	66.41
Multilateral operations	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
CO_2 emissions from biomass	10420.76	11391.32	11098.36	11635.76	11184.96	11883.33	12686.37	12154.32	11857.27	13593.46
CO_2 captured	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Long-term storage of C in waste disposal sites	22778.82	23458.60	24066.57	24662.12	25119.30	25543.19	25970.84	26378.02	26788.92	27198.55
Indirect N_2O										
Indirect CO_2 [(3)]	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA
Total CO_2 eq without LULUCF	62292.97	65900.42	60432.20	60788.48	61191.09	64206.70	67674.01	67454.13	67054.86	65702.17
Total $CO_{2\,eq}$ with LULUCF	49986.36	48951.42	48433.86	48429.69	48910.01	50633.33	56656.27	48063.64	49533.50	46051.80
Total CO_2 eq. incl. indirect CO2, w/o LULUCF	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total CO_2 eq incl. indirect CO2, w LULUCF	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

CRF Table10s2 continued

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
	(kt)									
1. Energy	54152.30	58446.86	59630.47	65285.40	65496.38	65938.94	62603.01	59286.25	58814.75	55619.14
A. Fuel combustion (sectoral approach)	53987.58	58263.93	59463.23	65052.16	65286.15	65733.71	62370.77	59049.01	58602.50	55353.90
1. Energy industries	12259.93	13833.73	13429.74	16010.20	15974.95	16155.44	14982.26	13697.59	13517.56	12495.39
2. Manufacturing industries and construction	9945.32	10030.46	10474.54	10887.96	11124.25	11634.44	11250.56	10897.64	11285.50	10774.53
3. Transport	18645.32	20134.72	22037.08	23886.08	24404.31	24748.96	23444.66	23645.38	22228.86	21549.80
4. Other sectors	13096.22	14223.66	13479.97	14225.46	13739.60	13151.29	12649.22	10763.78	11525.39	10488.46
5. Other	40.80	41.36	41.91	42.47	43.03	43.57	44.06	44.63	45.19	45.72
B. Fugitive emissions from fuels	164.72	182.93	167.24	233.23	210.23	205.23	232.24	237.24	212.24	265.24
1. Solid fuels	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA
2. Oil and natural gas and other	164.72	182.93	167.24	233.23	210.23	205.23	232.24	237.24	212.24	265.24
C. CO_2 transport and storage	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2. Industrial processes	12082.35	11901.72	12459.79	12464.65	12553.85	13314.96	13965.52	14626.85	14879.40	11912.27
A. Mineral industry	2733.20	2758.67	2842.66	2829.34	2915.62	2888.79	3053.33	3265.67	3276.09	2714.92
B. Chemical industry	674.08	628.60	637.37	674.91	667.99	643.58	666.25	601.61	651.72	587.90
C. Metal industry	8447.33	8287.82	8767.78	8745.05	8761.68	9572.21	10037.36	10546.58	10740.33	8402.69
D. Non-energy products from fuels and solvent use	227.74	226.64	211.99	215.35	208.57	210.02	206.43	207.24	202.44	195.82
E. Electronic industry										
F. Product uses as ODS substitutes										
G. Other product manufacture and use	NO	NO	NO	NO	NO	0.36	2.15	5.76	8.82	10.94
H. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3. Agriculture	98.56	95.74	96.19	98.72	102.01	102.95	104.76	106.97	104.89	110.01
A. Enteric fermentation										
B. Manure management										
C. Rice cultivation										
D. Agricultural soils										
E. Prescribed burning of savannas										
F. Field burning of agricultural residues										
G. Liming	90.19	90.10	90.06	90.09	91.17	91.19	89.85	89.05	88.33	88.03
H. Urea application	8.37	5.64	6.13	8.62	10.84	11.76	14.91	17.92	16.55	21.97
I. Other carbon-containing fertilizers	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
J. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4. Land use, land-use change and forestry [(2)]	-16384.15	-19312.62	-14456.52	-5058.22	-9418.61	-10886.24	-5535.02	-5876.82	-4675.89	-4550.64
A. Forest land	-15998.58	-17950.89	-12256.89	-2264.48	-7345.42	-8796.87	-2982.13	-1954.11	-1059.64	-4497.65
B. Cropland	70.46	-120.60	-86.80	-111.47	-137.78	-153.76	-136.86	-260.51	-237.85	-251.02
C. Grassland	449.50	449.11	656.89	654.53	654.66	656.33	656.37	658.54	651.91	356.74
D. Wetlands	35.80	35.80	47.28	47.27	47.30	47.33	37.20	39.34	51.32	68.13
E. Settlements	498.16	495.09	575.79	575.38	573.25	569.51	565.61	540.82	575.89	481.74
F. Other land	365.82	366.71	335.49	336.44	328.28	320.12	312.01	303.89	295.78	211.27
G. Harvested wood products	-1805.30	-2587.85	-3728.28	-4295.88	-3538.91	-3528.89	-3987.22	-5204.80	-4953.32	-919.86
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
5. Waste	12.40	12.40	12.40	12.40	12.40	12.40	10.26	8.21	6.16	4.10
A. Solid waste disposal	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA
B. Biological treatment of solid waste										
C. Incineration and open burning of waste	12.40	12.40	12.40	12.40	12.40	12.40	10.26	8.21	6.16	4.10
D. Waste water treatment and discharge										
E. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
6. Other *(as specified in summary 1.A)*	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Memo items:										
International bunkers	1767.97	1727.79	1626.91	1521.59	1806.86	2040.20	2119.21	2251.24	2251.64	1952.94
Aviation	1695.58	1651.28	1540.85	1452.97	1724.93	1959.83	2048.88	2175.79	2181.97	1893.40
Navigation	72.39	76.51	86.06	68.62	81.93	80.37	70.33	75.44	69.67	59.54
Multilateral operations	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
CO_2 emissions from biomass	12758.15	13938.61	12902.53	13355.77	13478.80	15790.27	17046.93	18673.49	19945.08	20412.05
CO_2 captured	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Long-term storage of C in waste disposal sites	27613.89	28032.24	28492.82	29026.56	29181.14	29341.30	29517.62	29678.61	29794.49	29861.73
Indirect N_2O										
Indirect CO_2 [(3)]	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA
Total CO_2 eq without LULUCF	66345.61	70456.72	72198.85	77861.16	78164.64	79369.26	76683.54	74028.29	73805.19	67645.52
Total $CO_{2\,eq}$ with LULUCF	49961.46	51144.10	57742.33	72802.95	68746.03	68483.02	71148.52	68151.47	69129.30	63094.88
Total CO_2 eq. incl. indirect CO2, w/o LULUCF	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total CO_2 eq incl. indirect CO2, w LULUCF	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

CRF Table10s2 continued

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	2010	2011	2012	2013	2014	2015	Change from base to latest reported year
	(kt)						%
1. Energy	58665.54	56249.27	54129.96	54069.55	50206.87	52198.08	1.75
A. Fuel combustion (sectoral approach)	58428.29	56016.02	53892.71	53818.30	49985.62	51983.83	1.54
1. Energy industries	13851.46	13657.87	12246.33	11197.64	9527.23	10796.34	-21.71
2. Manufacturing industries and construction	11373.22	11306.88	11089.83	10946.14	10240.91	10313.91	5.17
3. Transport	22346.11	21693.60	21475.10	22618.89	21976.87	22378.14	62.43
4. Other sectors	10811.22	9310.82	9034.06	9007.66	8192.09	8446.37	-38.73
5. Other	46.28	46.84	47.40	47.97	48.52	49.07	40.17
B. Fugitive emissions from fuels	237.25	233.25	237.25	251.25	221.25	214.25	109.72
1. Solid fuels	NO,NA	NO,NA	NO,NA	NO,NA	NA,NO	NO,NA	0.00
2. Oil and natural gas and other	237.25	233.25	237.25	251.25	221.25	214.25	109.72
C. CO_2 transport and storage	NO	NO	NO	NO	NO	NO	0.00
2. Industrial processes	13772.58	13929.84	13480.66	13776.62	13884.13	14414.76	32.59
A. Mineral industry	2660.68	2779.36	2703.56	2719.69	2721.94	2739.63	-11.41
B. Chemical industry	676.79	692.81	662.16	599.41	715.91	699.81	8.75
C. Metal industry	10227.14	10245.82	9897.08	10252.63	10240.06	10769.79	58.68
D. Non-energy products from fuels and solvent use	192.92	195.72	200.11	181.81	181.98	179.01	-48.70
E. Electronic industry							
F. Product uses as ODS substitutes							
G. Other product manufacture and use	15.05	16.13	17.76	23.07	24.24	26.53	100.00
H. Other	NA	NA	NA	NA	NA	NA	0.00
3. Agriculture	107.24	105.60	108.42	107.86	111.31	109.27	15.72
A. Enteric fermentation							
B. Manure management							
C. Rice cultivation							
D. Agricultural soils							
E. Prescribed burning of savannas							
F. Field burning of agricultural residues							
G. Liming	87.68	87.24	86.73	86.36	85.87	85.66	-4.80
H. Urea application	19.56	18.36	21.69	21.51	25.44	23.61	430.44
I. Other carbon-containing fertilizers	NA	NA	NA	NA	NA	NA	0.00
J. Other	NA	NA	NA	NA	NA	NA	0.00
4. Land use, land-use change and forestry [(2)]	-6042.17	-6341.67	-5788.20	-4668.07	-5039.97	-4980.20	-59.53
A. Forest land	-4464.83	-4432.00	-4399.18	-4366.17	-4333.16	-4326.34	-60.28
B. Cropland	-266.60	-274.24	-271.32	-250.66	-209.49	-32.89	-122.23
C. Grassland	355.60	358.40	355.07	357.76	357.79	373.63	-40.45
D. Wetlands	68.79	73.41	69.78	101.17	71.05	58.52	39.06
E. Settlements	453.73	433.93	444.48	401.85	405.86	376.45	-34.77
F. Other land	203.62	195.97	188.32	180.80	173.27	169.62	-61.82
G. Harvested wood products	-2392.49	-2697.15	-2175.35	-1092.83	-1505.29	-1599.20	-50.84
H. Other	NO	NO	NO	NO	NO	NO	0.00
5. Waste	2.05	2.05	2.05	2.05	2.05	2.05	-92.65
A. Solid waste disposal	NO,NA	NO,NA	NO,NA	NO,NA	NA,NO	NO,NA	0.00
B. Biological treatment of solid waste							
C. Incineration and open burning of waste	2.05	2.05	2.05	2.05	2.05	2.05	-92.65
D. Waste water treatment and discharge							
E. Other	NO	NO	NO	NO	NO	NO	0.00
6. Other ***(as specified in summary 1.A)***	NO	NO	NO	NO	NO	NO	0.00
Memo items:							
International bunkers	2120.08	2230.68	2136.52	2044.04	2040.64	2180.37	133.08
Aviation	2049.55	2168.44	2072.66	1975.44	1976.70	2127.50	140.13
Navigation	70.53	62.24	63.86	68.60	63.94	52.87	6.85
Multilateral operations	NO	NO	NO	NO	NO	NO	0.00
CO_2 emissions from biomass	23021.95	22403.35	23425.07	24468.61	22200.67	23378.08	124.34
CO_2 captured	NO	NO	NO	NO	NO	NO	0.00
Long-term storage of C in waste disposal sites	29926.26	29998.18	30041.79	30089.86	30135.39	30170.22	32.45
Indirect N_2O							
Indirect CO_2 [(3)]	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	0.00
Total CO_2 eq without LULUCF	72547.42	70286.77	67721.10	67956.09	64204.37	66724.17	7.11
Total $CO_{2\,eq}$ with LULUCF	66505.25	63945.09	61932.90	63288.02	59164.40	61743.97	23.52
Total CO_2 eq. incl. indirect CO2, w/o LULUCF	NA	NA	NA	NA	NA	NA	0.00
Total CO_2 eq incl. indirect CO2, w LULUCF	NA	NA	NA	NA	NA	NA	0.00

CRF Table 10s3

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
	(kt)									
1. Energy	51.68	48.19	46.75	44.21	36.77	36.95	37.02	31.67	31.02	31.35
A. Fuel combustion (sectoral approach)	27.70	29.87	27.08	25.48	23.06	23.48	24.20	19.04	18.15	18.33
1. Energy industries	0.31	0.34	0.31	0.34	0.34	0.35	0.41	0.42	0.42	0.40
2. Manufacturing industries and construction	0.54	0.59	0.58	0.60	0.60	0.60	0.62	0.64	0.59	0.70
3. Transport	2.62	2.60	2.29	2.03	1.84	1.67	1.49	1.33	1.31	1.14
4. Other sectors	24.23	26.34	23.90	22.50	20.27	20.85	21.68	16.65	15.83	16.09
5. Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B. Fugitive emissions from fuels	23.99	18.32	19.67	18.73	13.70	13.47	12.82	12.62	12.86	13.02
1. Solid fuels	13.33	7.25	7.69	6.57	2.26	1.47	0.97	0.98	0.99	0.99
2. Oil and natural gas and other	10.66	11.07	11.98	12.15	11.45	12.00	11.85	11.64	11.87	12.03
C. CO_2 transport and storage										
2. Industrial processes	1.40	1.40	1.36	1.40	1.41	1.38	1.39	1.40	1.43	1.39
A. Mineral industry										
B. Chemical industry	1.40	1.40	1.36	1.40	1.41	1.38	1.39	1.40	1.43	1.39
C. Metal industry	NO,NA,IE	NO,NA,IE	NO,NA,IE	NO,NA,IE	NO,NA,IE	NO,NA,IE	NO,NA,IE	NO,NA,IE	NO,NA,IE	NO,NA,IE
D. Non-energy products from fuels and solvent use	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
E. Electronic industry										
F. Product uses as ODS substitutes										
G. Other product manufacture and use	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
H. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3. Agriculture	216.36	213.08	204.43	204.34	204.34	207.79	204.31	200.64	199.16	196.90
A. Enteric fermentation	192.82	189.97	182.01	181.89	182.12	185.53	182.53	179.27	177.92	176.43
B. Manure management	23.48	23.06	22.36	22.40	22.17	22.21	21.73	21.31	21.19	20.41
C. Rice cultivation	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
D. Agricultural soils	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
E. Prescribed burning of savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Field burning of agricultural residues	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
G. Liming										
H. Urea application										
I. Other carbon-containing fertilizers										
J. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4. Land use, land-use change and forestry	0.97	0.96	0.96	0.96	0.96	0.95	0.95	0.95	0.96	0.95
A. Forest land	0.02	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.01	0.00
B. Cropland	IE,NO	IE,NO	IE,NO	IE,NO	IE,NO	IE,NO	IE,NO	IE,NO	IE,NO	IE,NO
C. Grassland	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
D. Wetlands	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
E. Settlements	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Other land	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
G. Harvested wood products										
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
5. Waste	151.13	153.95	152.33	151.01	146.64	139.45	131.60	125.55	120.51	115.46
A. Solid waste disposal	145.76	148.57	146.97	145.63	141.27	134.20	126.64	120.95	116.21	111.35
B. Biological treatment of solid waste	0.52	0.55	0.65	0.82	0.98	1.04	1.09	1.08	1.12	1.18
C. Incineration and open burning of waste	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
D. Waste water treatment and discharge	4.85	4.84	4.70	4.56	4.39	4.21	3.87	3.53	3.19	2.93
E. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
6. Other ***(as specified in summary 1.A)***	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Total CH_4 w/o CH_4 from LULUCF	420.57	416.62	404.88	400.95	389.15	385.58	374.33	359.26	352.12	345.10
Total CH_4 with CH_4 from LULUCF	421.54	417.57	405.84	401.92	390.11	386.53	375.28	360.21	353.08	346.06
Memo items:										
International bunkers	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03
Aviation	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03
Navigation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Multilateral operations	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
CO_2 emissions from biomass										
CO_2 captured										
Long-term storage of C in waste disposal sites										
Indirect N_2O										
Indirect CO_2 [(3)]										

CRF Table 10s3 continued

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
	(kt)									
1. Energy	30.33	30.58	28.93	28.44	26.54	24.89	24.61	23.93	23.47	23.07
A. Fuel combustion (sectoral approach)	17.06	17.32	15.67	15.19	14.51	13.81	13.21	12.45	12.67	12.06
1. Energy industries	0.39	0.46	0.48	0.54	0.59	0.61	0.70	0.75	0.82	0.91
2. Manufacturing industries and construction	0.65	0.69	0.66	0.71	0.75	0.80	0.82	0.89	0.92	0.93
3. Transport	1.05	1.00	1.00	0.97	0.90	0.83	0.73	0.67	0.58	0.52
4. Other sectors	14.98	15.16	13.53	12.96	12.27	11.56	10.95	10.15	10.34	9.70
5. Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B. Fugitive emissions from fuels	13.27	13.27	13.26	13.25	12.03	11.08	11.40	11.48	10.80	11.01
1. Solid fuels	1.09	1.05	1.23	1.00	0.21	0.01	0.01	NO,NA	NO,NA	NO,NA
2. Oil and natural gas and other	12.18	12.22	12.03	12.25	11.82	11.08	11.40	11.48	10.80	11.01
C. CO_2 transport and storage										
2. Industrial processes	1.40	1.37	1.40	1.39	1.40	1.45	1.92	1.90	1.88	1.84
A. Mineral industry										
B. Chemical industry	1.40	1.37	1.40	1.39	1.40	1.45	1.92	1.90	1.88	1.84
C. Metal industry	NO,NA,IE	NO,NA,IE	NO,NA,IE	NO,NA,IE	NO,NA,IE	NO,NA,IE	NO,NA,IE	NO,NA,IE	NO,NA,IE	NO,NA,IE
D. Non-energy products from fuels and solvent use	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
E. Electronic industry										
F. Product uses as ODS substitutes										
G. Other product manufacture and use	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
H. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3. Agriculture	195.56	192.99	188.93	186.80	186.56	184.36	183.70	184.45	183.87	186.27
A. Enteric fermentation	175.47	173.08	169.58	167.86	167.92	165.86	165.38	166.06	165.81	167.99
B. Manure management	20.05	19.86	19.30	18.90	18.57	18.46	18.28	18.35	18.01	18.24
C. Rice cultivation	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
D. Agricultural soils	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
E. Prescribed burning of savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Field burning of agricultural residues	0.05	0.05	0.05	0.05	0.07	0.04	0.04	0.04	0.04	0.04
G. Liming										
H. Urea application										
I. Other carbon-containing fertilizers										
J. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4. Land use, land-use change and forestry	0.96	0.95	0.97	0.97	0.95	0.95	0.96	0.95	0.96	0.96
A. Forest land	0.00	0.00	0.02	0.02	0.00	0.00	0.01	0.00	0.00	0.01
B. Cropland	IE,NO	IE,NO	IE,NO	IE,NO	IE,NO	IE,NO	IE,NO	IE,NO	IE,NO	IE,NO
C. Grassland	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
D. Wetlands	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
E. Settlements	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Other land	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
G. Harvested wood products										
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
5. Waste	110.61	106.18	105.75	105.59	107.50	101.63	96.73	91.61	87.17	81.34
A. Solid waste disposal	106.67	102.32	101.96	101.81	103.47	97.51	92.55	87.36	82.94	77.16
B. Biological treatment of solid waste	1.25	1.43	1.61	1.84	2.24	2.48	2.70	2.86	2.94	2.98
C. Incineration and open burning of waste	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
D. Waste water treatment and discharge	2.68	2.43	2.18	1.95	1.79	1.64	1.48	1.39	1.29	1.20
E. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
6. Other ***(as specified in summary 1.A)***	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Total CH_4 w/o CH_4 from LULUCF	337.89	331.12	325.02	322.23	321.99	312.34	306.96	301.89	296.39	292.52
Total CH_4 with CH_4 from LULUCF	338.85	332.08	325.99	323.19	322.95	313.29	307.92	302.84	297.35	293.47
Memo items:										
International bunkers	0.03	0.03	0.04	0.04	0.05	0.04	0.04	0.05	0.05	0.04
Aviation	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Navigation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Multilateral operations	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
CO_2 emissions from biomass										
CO_2 captured										
Long-term storage of C in waste disposal sites										
Indirect N_2O										
Indirect CO_2 [(3)]										

CRF Table 10s3 continued

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	2010	2011	2012	2013	2014	2015	Change from base to latest reported year
	(kt)						%
1. Energy	24.54	23.20	23.92	24.18	21.72	22.41	-56.64
A. Fuel combustion (sectoral approach)	13.17	11.94	12.29	12.96	10.94	11.90	-57.02
1. Energy industries	1.03	1.02	1.04	0.99	0.95	1.02	233.29
2. Manufacturing industries and construction	0.94	0.95	0.91	0.92	0.86	0.88	62.49
3. Transport	0.48	0.45	0.41	0.39	0.36	0.35	-86.57
4. Other sectors	10.72	9.53	9.92	10.65	8.77	9.65	-60.18
5. Other	0.00	0.00	0.00	0.00	0.00	0.00	34.51
B. Fugitive emissions from fuels	11.37	11.26	11.63	11.22	10.78	10.51	-56.20
1. Solid fuels	NO,NA	NO,NA	NO,NA	NO,NA	NA,NO	NO,NA	
2. Oil and natural gas and other	11.37	11.26	11.63	11.22	10.78	10.51	-1.41
C. CO_2 transport and storage							
2. Industrial processes	1.87	1.87	1.87	1.96	1.87	1.88	33.59
A. Mineral industry							
B. Chemical industry	1.87	1.87	1.87	1.96	1.87	1.88	33.59
C. Metal industry	NO,NA,IE	NO,NA,IE	NO,NA,IE	NO,NA,IE	NA,NO,IE	NO,IE,NA	0.00
D. Non-energy products from fuels and solvent use	NA	NA	NA	NA	NA	NA	0.00
E. Electronic industry							
F. Product uses as ODS substitutes							
G. Other product manufacture and use	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NO,NA	0.00
H. Other	NA	NA	NA	NA	NA	NA	0.00
3. Agriculture	185.79	183.38	182.09	182.31	183.06	182.78	-15.52
A. Enteric fermentation	167.59	165.50	164.41	164.69	165.45	165.23	-14.31
B. Manure management	18.16	17.85	17.66	17.59	17.58	17.52	-25.37
C. Rice cultivation	NO	NO	NO	NO	NO	NO	0.00
D. Agricultural soils	NA	NA	NA	NA	NA	NA	0.00
E. Prescribed burning of savannas	NO	NO	NO	NO	NO	NO	0.00
F. Field burning of agricultural residues	0.04	0.03	0.02	0.02	0.02	0.02	-58.49
G. Liming							
H. Urea application							
I. Other carbon-containing fertilizers							
J. Other	NA	NA	NA	NA	NA	NA	0.00
4. Land use, land-use change and forestry	0.96	0.96	0.96	0.96	0.96	0.96	-0.59
A. Forest land	0.00	0.00	0.01	0.01	0.01	0.01	-30.65
B. Cropland	IE,NO	IE,NO	IE,NO	IE,NO	NO,IE	NO,IE	0.00
C. Grassland	0.95	0.95	0.95	0.95	0.95	0.95	0.00
D. Wetlands	NO	NO	NO	NO	NO	NO	0.00
E. Settlements	NO	NO	NO	NO	NO	NO	0.00
F. Other land	NO	NO	NO	NO	NO	NO	0.00
G. Harvested wood products							
H. Other	NO	NO	NO	NO	NO	NO	0.00
5. Waste	76.24	71.55	67.45	63.06	59.34	55.93	-62.99
A. Solid waste disposal	72.10	67.45	63.30	59.08	55.27	51.76	-64.49
B. Biological treatment of solid waste	3.03	3.06	3.15	3.02	3.15	3.24	523.07
C. Incineration and open burning of waste	0.00	0.00	0.00	0.00	0.00	0.00	-94.39
D. Waste water treatment and discharge	1.10	1.05	1.00	0.96	0.92	0.93	-80.78
E. Other	NO	NO	NO	NO	NO	NO	0.00
6. Other ***(as specified in summary 1.A)***	NO	NO	NO	NO	NO	NO	0.00
Total CH_4 w/o CH_4 from LULUCF	288.43	280.00	275.34	271.52	265.99	263.00	-37.47
Total CH_4 with CH_4 from LULUCF	289.39	280.96	276.30	272.48	266.95	263.96	-37.38
Memo items:							
International bunkers	0.04	0.05	0.05	0.05	0.05	0.05	181.13
Aviation	0.04	0.05	0.04	0.04	0.04	0.05	219.84
Navigation	0.00	0.00	0.00	0.00	0.00	0.00	-47.68
Multilateral operations	NO	NO	NO	NO	NO	NO	0.00
CO_2 emissions from biomass							
CO_2 captured							
Long-term storage of C in waste disposal sites							
Indirect N_2O							
Indirect CO_2 [3]							

CRF Table10s4

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
	(kt)									
1. Energy	1.47	1.60	1.56	1.57	1.56	1.61	1.71	1.68	1.69	1.72
A. Fuel combustion (sectoral approach)	1.47	1.60	1.56	1.57	1.56	1.61	1.71	1.68	1.69	1.72
1. Energy industries	0.13	0.15	0.11	0.11	0.11	0.13	0.15	0.15	0.14	0.13
2. Manufacturing industries and construction	0.23	0.25	0.26	0.28	0.28	0.29	0.33	0.33	0.35	0.38
3. Transport	0.45	0.51	0.52	0.52	0.53	0.53	0.52	0.50	0.53	0.50
4. Other sectors	0.65	0.69	0.67	0.66	0.64	0.65	0.71	0.69	0.68	0.70
5. Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B. Fugitive emissions from fuels	NA,NO,IE	NA,NO,IE	NA,NO,IE	NA,NO,IE	NA,NO,IE	NA,NO,IE	NA,NO,IE	NA,NO,IE	NA,NO,IE	NA,NO,IE
1. Solid fuels	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA
2. Oil and natural gas and other	NA,NO,IE	NA,NO,IE	NA,NO,IE	NA,NO,IE	NA,NO,IE	NA,NO,IE	NA,NO,IE	NA,NO,IE	NA,NO,IE	NA,NO,IE
C. CO_2 transport and storage										
2. Industrial processes	3.69	3.74	3.45	3.58	3.41	3.52	3.57	3.53	3.64	3.73
A. Mineral industry										
B. Chemical industry	2.94	2.99	2.70	2.83	2.66	2.77	2.82	2.78	2.89	2.98
C. Metal industry	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
D. Non-energy products from fuels and solvent use	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
E. Electronic industry										
F. Product uses as ODS substitutes										
G. Other product manufacture and use	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
H. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3. Agriculture	9.01	9.37	8.65	8.19	9.04	9.21	8.66	8.80	8.82	8.65
A. Enteric fermentation										
B. Manure management	1.47	1.47	1.44	1.46	1.47	1.53	1.51	1.50	1.51	1.48
C. Rice cultivation										
D. Agricultural soils	7.54	7.89	7.21	6.73	7.56	7.68	7.15	7.30	7.31	7.16
E. Prescribed burning of savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Field burning of agricultural residues	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
G. Liming										
H. Urea application										
I. Other carbon containing fertlizers										
J. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4. Land use, land-use change and forestry	0.48	0.49	0.50	0.50	0.50	0.49	0.48	0.47	0.46	0.45
A. Forest land	0.10	0.11	0.11	0.11	0.11	0.10	0.10	0.09	0.08	0.08
B. Cropland	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
C. Grassland	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
D. Wetlands	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
E. Settlements	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.23	0.23
F. Other land	0.04	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
G. Harvested wood products										
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
5. Waste	0.40	0.41	0.43	0.45	0.49	0.52	0.54	0.55	0.57	0.59
A. Solid waste disposal										
B. Biological treatment of solid waste	0.08	0.08	0.09	0.12	0.14	0.14	0.15	0.15	0.15	0.16
C. Incineration and open burning of waste	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
D. Waste water treatment and discharge	0.32	0.33	0.33	0.34	0.35	0.37	0.39	0.40	0.42	0.43
E. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
6. Other ***(as specified in summary 1.A)***	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Total direct N_2O w/o N_2O from LULUCF	14.57	15.12	14.09	13.80	14.50	14.85	14.49	14.57	14.73	14.69
Total direct N_2O with N_2O from LULUCF	15.05	15.60	14.58	14.30	15.00	15.34	14.96	15.03	15.18	15.14
Memo items:										
International bunkers	0.05	0.05	0.05	0.06	0.06	0.07	0.07	0.08	0.08	0.08
Aviation	0.03	0.03	0.04	0.04	0.04	0.05	0.05	0.05	0.06	0.05
Navigation	0.02	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Multilateral operations	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
CO_2 emissions from biomass										
CO_2 captured										
Long-term storage of C in waste disposal sites										
Indirect N_2O	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA
Indirect CO_2 (3)										

CRF Table10s4 continued

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
	(kt)									
1. Energy	1.72	1.80	1.78	1.84	1.85	1.92	1.95	1.97	1.98	1.93
A. Fuel combustion (sectoral approach)	1.72	1.80	1.78	1.84	1.85	1.92	1.95	1.97	1.98	1.93
1. Energy industries	0.15	0.18	0.19	0.22	0.24	0.23	0.27	0.29	0.31	0.32
2. Manufacturing industries and construction	0.40	0.41	0.38	0.40	0.42	0.47	0.48	0.50	0.51	0.50
3. Transport	0.49	0.50	0.54	0.55	0.55	0.55	0.55	0.56	0.55	0.55
4. Other sectors	0.67	0.70	0.67	0.66	0.64	0.67	0.64	0.61	0.61	0.56
5. Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B. Fugitive emissions from fuels	NA,NO,IE	NA,NO,IE	NA,NO,IE	NA,NO,IE	NA,NO,IE	NA,NO,IE	NA,NO,IE	NA,NO,IE	NA,NO,IE	NA,NO,IE
1. Solid fuels	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA
2. Oil and natural gas and other	NA,NO,IE	NA,NO,IE	NA,NO,IE	NA,NO,IE	NA,NO,IE	NA,NO,IE	NA,NO,IE	NA,NO,IE	NA,NO,IE	NA,NO,IE
C. CO_2 transport and storage										
2. Industrial processes	3.82	3.25	3.28	3.49	1.50	1.44	1.43	1.39	1.56	1.00
A. Mineral industry										
B. Chemical industry	3.07	2.54	2.60	2.85	0.91	0.88	0.90	0.87	1.05	0.53
C. Metal industry	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
D. Non-energy products from fuels and solvent use	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
E. Electronic industry										
F. Product uses as ODS substitutes										
G. Other product manufacture and use	0.75	0.71	0.67	0.64	0.60	0.56	0.53	0.52	0.51	0.47
H. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3. Agriculture	8.45	8.48	8.45	8.12	8.07	8.03	7.99	8.05	8.47	8.32
A. Enteric fermentation										
B. Manure management	1.48	1.49	1.46	1.46	1.46	1.46	1.46	1.49	1.48	1.50
C. Rice cultivation										
D. Agricultural soils	6.97	7.00	6.98	6.66	6.60	6.57	6.52	6.57	6.99	6.81
E. Prescribed burning of savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Field burning of agricultural residues	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
G. Liming										
H. Urea application										
I. Other carbon containing fertlizers										
J. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4. Land use, land-use change and forestry	0.45	0.45	0.44	0.44	0.44	0.43	0.43	0.44	0.44	0.44
A. Forest land	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
B. Cropland	0.04	0.04	0.04	0.04	0.04	0.04	0.05	0.05	0.05	0.06
C. Grassland	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
D. Wetlands	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
E. Settlements	0.23	0.23	0.23	0.23	0.23	0.23	0.22	0.22	0.22	0.22
F. Other land	0.05	0.05	0.05	0.05	0.05	0.04	0.04	0.04	0.04	0.04
G. Harvested wood products										
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
5. Waste	0.62	0.67	0.69	0.72	0.77	0.80	0.81	0.82	0.82	0.83
A. Solid waste disposal										
B. Biological treatment of solid waste	0.17	0.20	0.22	0.24	0.28	0.30	0.30	0.31	0.30	0.30
C. Incineration and open burning of waste	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
D. Waste water treatment and discharge	0.45	0.47	0.48	0.48	0.49	0.50	0.51	0.52	0.52	0.53
E. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
6. Other ***(as specified in summary 1.A)***	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Total direct N_2O w/o N_2O from LULUCF	14.61	14.20	14.20	14.17	12.19	12.19	12.18	12.23	12.83	12.08
Total direct N_2O with N_2O from LULUCF	15.06	14.64	14.65	14.61	12.63	12.63	12.61	12.66	13.27	12.52
Memo items:										
International bunkers	0.08	0.08	0.08	0.07	0.09	0.09	0.09	0.10	0.10	0.08
Aviation	0.06	0.06	0.05	0.05	0.06	0.07	0.07	0.07	0.07	0.06
Navigation	0.03	0.03	0.03	0.02	0.03	0.03	0.02	0.03	0.02	0.02
Multilateral operations	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
CO_2 emissions from biomass										
CO_2 captured										
Long-term storage of C in waste disposal sites										
Indirect N_2O	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA
Indirect CO_2 (3)										

CRF Table10s4 continued

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	2010	2011	2012	2013	2014	2015	Change from base to latest reported year
	(kt)						%
1. Energy	2.02	1.99	1.99	2.05	1.93	1.99	35.62
A. Fuel combustion (sectoral approach)	2.02	1.99	1.99	2.05	1.93	1.99	35.62
1. Energy industries	0.37	0.38	0.38	0.36	0.34	0.35	167.42
2. Manufacturing industries and construction	0.49	0.49	0.48	0.47	0.45	0.44	90.70
3. Transport	0.57	0.57	0.59	0.64	0.65	0.67	50.44
4. Other sectors	0.57	0.55	0.54	0.57	0.50	0.52	-20.72
5. Other	0.00	0.00	0.00	0.00	0.00	0.00	14.93
B. Fugitive emissions from fuels	NA,NO,IE	NA,NO,IE	NA,NO,IE	NA,NO,IE	NA,NO,IE	NO,IE,NA	0.00
1. Solid fuels	NO,NA	NO,NA	NO,NA	NO,NA	NA,NO	NO,NA	0.00
2. Oil and natural gas and other	NA,NO,IE	NA,NO,IE	NA,NO,IE	NA,NO,IE	NA,NO,IE	NO,IE,NA	0.00
C. CO_2 transport and storage							
2. Industrial processes	0.69	0.63	0.62	0.62	0.61	0.61	-83.61
A. Mineral industry							
B. Chemical industry	0.20	0.15	0.17	0.16	0.16	0.16	-94.66
C. Metal industry	NO	NO	NO	NO	NO	NO	0.00
D. Non-energy products from fuels and solvent use	NA	NA	NA	NA	NA	NA	0.00
E. Electronic industry							
F. Product uses as ODS substitutes							
G. Other product manufacture and use	0.48	0.47	0.45	0.46	0.45	0.45	-40.29
H. Other	NA	NA	NA	NA	NA	NA	0.00
3. Agriculture	7.86	8.24	8.11	8.03	8.37	8.35	-7.31
A. Enteric fermentation							
B. Manure management	1.50	1.48	1.47	1.47	1.47	1.47	0.12
C. Rice cultivation							
D. Agricultural soils	6.36	6.76	6.64	6.56	6.90	6.88	-8.75
E. Prescribed burning of savannas	NO	NO	NO	NO	NO	NO	0.00
F. Field burning of agricultural residues	0.00	0.00	0.00	0.00	0.00	0.00	-69.72
G. Liming							
H. Urea application							
I. Other carbon containing fertlizers							
J. Other	NA	NA	NA	NA	NA	NA	0.00
4. Land use, land-use change and forestry	0.44	0.44	0.44	0.44	0.44	0.44	-7.87
A. Forest land	0.08	0.08	0.08	0.08	0.08	0.08	-20.63
B. Cropland	0.06	0.06	0.06	0.06	0.06	0.07	52.80
C. Grassland	NO	NO	NO	NO	NO	NO	0.00
D. Wetlands	NO	NO	NO	NO	NO	NO	0.00
E. Settlements	0.23	0.23	0.23	0.23	0.22	0.22	-8.63
F. Other land	0.03	0.03	0.03	0.03	0.03	0.03	-39.10
G. Harvested wood products							
H. Other	NO	NO	NO	NO	NO	NO	0.00
5. Waste	0.84	0.84	0.85	0.84	0.85	0.86	114.60
A. Solid waste disposal							
B. Biological treatment of solid waste	0.31	0.31	0.32	0.30	0.31	0.32	313.93
C. Incineration and open burning of waste	0.00	0.00	0.00	0.00	0.00	0.00	-95.78
D. Waste water treatment and discharge	0.53	0.53	0.53	0.53	0.54	0.54	67.72
E. Other	NO	NO	NO	NO	NO	NO	0.00
6. Other ***(as specified in summary 1.A)***	NO	NO	NO	NO	NO	NO	0.00
Total direct N_2O w/o N_2O from LULUCF	11.41	11.71	11.58	11.54	11.77	11.80	-18.99
Total direct N_2O with N_2O from LULUCF	11.85	12.15	12.02	11.98	12.21	12.25	-18.63
Memo items:							
International bunkers	0.09	0.09	0.09	0.09	0.08	0.08	76.47
Aviation	0.07	0.07	0.07	0.07	0.07	0.07	128.29
Navigation	0.02	0.02	0.02	0.02	0.02	0.01	-16.32
Multilateral operations	NO	NO	NO	NO	NO	NO	0.00
CO_2 emissions from biomass							
CO_2 captured							
Long-term storage of C in waste disposal sites							
Indirect N_2O	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	NO,NE,NA	0.00
Indirect CO_2 (3)							

CRF Table10s5

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
	(kt)									
Emissions HFCs PFCs - (kt CO_2 eq)	1185.22	1196.51	516.11	298.78	332.06	436.80	497.46	615.61	664.08	780.11
Emissions of HFCs - (kt CO_2 eq)	2.44	3.89	5.64	235.26	261.11	353.45	417.20	498.14	608.55	700.92
HFC-23	NO,NA	NO,NA	NO,NA	0.00	NO,NA,IE	NO,NA,IE	NO,NA,IE	NO,NA,IE	NO,NA,IE	NO,NA,IE
HFC-32	NO,NA	NO,NA	NO,NA	NO,NA	0.00	0.00	0.00	0.00	0.00	0.00
HFC-41	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HFC-43-10mee	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA
HFC-125	NO,NA	NO,NA	NO,NA	0.00	0.00	0.00	0.00	0.01	0.01	0.02
HFC-134	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HFC-134a	NO,NA	NO,NA	0.00	0.15	0.16	0.22	0.25	0.29	0.34	0.38
HFC-143	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HFC-143a	NO,NA	NO,NA	NO,NA	0.00	0.00	0.00	0.00	0.01	0.01	0.02
HFC-152	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HFC-152a	NO,NA	NO,NA	NO,NA	0.07	0.08	0.08	0.09	0.10	0.10	0.10
HFC-161	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HFC-227ea	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	0.00	0.00
HFC-236cb	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HFC-236ea	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HFC-236fa	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HFC-245ca	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HFC-245fa	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA
HFC-365mfc	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA
Unspecified mix of HFCs[4] - (kt CO_2 equivalent)	2.44	3.89	5.62	7.35	9.08	10.79	12.32	11.93	3.75	4.09
Emissions of PFCs - (kt CO_2 eq)	1182.79	1192.62	510.47	63.52	70.96	83.35	80.25	117.47	55.53	79.18
CF_4	0.14	0.14	0.05	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA
C_2F_6	0.01	0.01	0.00	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA
C_3F_8	NO,NA	NO,NA	NO,NA	NA,NO,IE	NA,NO,IE	NA,NO,IE	NA,NO,IE	NA,NO,IE	NA,NO,IE	NA,NO,IE
C_4F_{10}	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA
c-C_4F_8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
C_5F_{12}	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
C_6F_{14}	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
$C_{10}F_{18}$	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
c-C_3F_6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Unspecified mix of PFCs[4] - (kt CO_2 eq)	34.03	43.86	53.69	63.52	70.96	83.35	80.25	117.47	55.53	79.18
Unspecified mix of HFCs and PFCs	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
Emissions of SF_6 - (kt CO_2 eq)	470.61	614.14	656.27	744.00	926.17	1100.11	1176.90	1086.40	869.88	676.37
SF_6	0.02	0.03	0.03	0.03	0.04	0.05	0.05	0.05	0.04	0.03
Emissions of NF_3 - (kt CO_2 eq)	NO,NA	NO,NA	NO,NA	NO,NA	0.76	6.44	7.93	15.53	9.43	8.24
NF_3	NO,NA	NO,NA	NO,NA	NO,NA	0.00	0.00	0.00	0.00	0.00	0.00

CRF Table10s5 continued

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
	(kt)									
Emissions HFCs PFCs - (kt CO_2 eq)	801.49	979.44	1070.75	1198.57	1315.92	1309.09	1324.85	1426.22	1456.72	1344.80
Emissions of HFCs - (kt CO_2 eq)	713.63	863.10	968.78	1072.19	1158.34	1145.81	1152.47	1195.89	1248.53	1308.77
HFC-23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HFC-32	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.03	0.03
HFC-41	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HFC-43-10mee	0.00	0.00	0.00	0.00	0.00	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA
HFC-125	0.03	0.04	0.04	0.06	0.06	0.07	0.08	0.08	0.09	0.10
HFC-134	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HFC-134a	0.30	0.34	0.35	0.39	0.43	0.41	0.38	0.39	0.39	0.39
HFC-143	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HFC-143a	0.02	0.03	0.04	0.05	0.05	0.06	0.06	0.07	0.07	0.08
HFC-152	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HFC-152a	0.60	0.61	0.95	0.64	0.43	0.20	0.25	0.25	0.09	0.13
HFC-161	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HFC-227ea	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HFC-236cb	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HFC-236ea	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HFC-236fa	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HFC-245ca	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HFC-245fa	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HFC-365mfc	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Unspecified mix of HFCs[4] - (kt CO_2 equivalent)	4.78	5.61	5.11	4.91	5.14	5.03	6.36	8.94	9.35	2.16
Emissions of PFCs - (kt CO_2 eq)	87.87	116.34	101.97	126.38	157.57	163.29	172.39	230.33	208.19	36.02
CF_4	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA
C_2F_6	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA
C_3F_8	NA,NO,IE	NA,NO,IE	NA,NO,IE	NA,NO,IE	NA,NO,IE	NA,NO,IE	0.00	0.00	0.00	NA,NO,IE
C_4F_{10}	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA
c-C_4F_8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
C_5F_{12}	0.00	NA,NO	NA,NO	NA,NO	NA,NO	0.00	NA,NO	NA,NO	NA,NO	NA,NO
C_6F_{14}	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
$C_{10}F_{18}$	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
c-C_3F_6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Unspecified mix of PFCs[4] - (kt CO_2 eq)	87.32	116.34	101.97	126.38	157.57	157.79	170.57	228.85	207.25	36.02
Unspecified mix of HFCs and PFCs	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
Emissions of SF_6 - (kt CO_2 eq)	574.53	629.33	613.30	549.44	484.01	493.63	453.46	367.01	373.43	341.68
SF_6	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.01
Emissions of NF_3 - (kt CO_2 eq)	10.51	10.51	10.51	21.56	26.54	28.16	32.73	59.39	53.47	4.54
NF_3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

CRF Table10s5 continued

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	2010	2011	2012	2013	2014	2015	Change from base to latest reported year
	(kt)						%
Emissions HFCs PFCs - (kt CO_2 eq)	1561.50	1609.60	1663.47	1652.11	1696.22	1711.59	44.41
Emissions of HFCs - (kt CO_2 eq)	1483.45	1536.09	1612.75	1602.88	1643.19	1662.04	68084.68
HFC-23	0.00	0.00	0.00	0.00	0.00	0.00	100.00
HFC-32	0.04	0.05	0.05	0.06	0.06	0.07	100.00
HFC-41	NA	NA	NA	NA	NA	NA	0.00
HFC-43-10mee	NO,NA	NO,NA	NO,NA	NO,NA	NA,NO	NO,NA	0.00
HFC-125	0.12	0.13	0.13	0.13	0.13	0.14	100.00
HFC-134	NA	NA	NA	NA	NA	NA	0.00
HFC-134a	0.42	0.44	0.47	0.48	0.50	0.52	100.00
HFC-143	NA	NA	NA	NA	NA	NA	0.00
HFC-143a	0.09	0.09	0.09	0.09	0.09	0.08	100.00
HFC-152	NA	NA	NA	NA	NA	NA	0.00
HFC-152a	0.13	NO,NA	NO,NA	NO,NA	NA,NO	NO,NA	0.00
HFC-161	NA	NA	NA	NA	NA	NA	0.00
HFC-227ea	0.00	0.00	0.00	0.00	0.00	0.00	100.00
HFC-236cb	NA	NA	NA	NA	NA	NA	0.00
HFC-236ea	NA	NA	NA	NA	NA	NA	0.00
HFC-236fa	NA	NA	NA	NA	NA	NA	0.00
HFC-245ca	NA	NA	NA	NA	NA	NA	0.00
HFC-245fa	0.00	0.00	0.00	0.00	0.00	0.00	100.00
HFC-365mfc	0.00	0.00	0.00	0.00	0.00	0.00	100.00
Unspecified mix of HFCs[4] - (kt CO_2 equivalent)	2.05	2.06	2.09	2.12	2.01	2.37	-2.91
Emissions of PFCs - (kt CO_2 eq)	78.05	73.51	50.72	49.23	53.03	49.55	-95.81
CF_4	NO,NA	NO,NA	NO,NA	NO,NA	NA,NO	NO,NA	
C_2F_6	NO,NA	NO,NA	NO,NA	NO,NA	NA,NO	NO,NA	
C_3F_8	NA,NO,IE	NA,NO,IE	NA,NO,IE	NA,NO,IE	NA,NO,IE	NO,IE,NA	0.00
C_4F_{10}	NO,NA	NO,NA	NO,NA	NO,NA	NA,NO	NO,NA	0.00
c-C_4F_8	NA	NA	NA	NA	NA	NA	0.00
C_5F_{12}	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NO,NA	0.00
C_6F_{14}	NA	NA	NA	NA	NA	NA	0.00
$C_{10}F_{18}$	NA	NA	NA	NA	NA	NA	0.00
c-C_3F_6	NA	NA	NA	NA	NA	NA	0.00
Unspecified mix of PFCs[4] - (kt CO_2 eq)	78.05	73.51	50.72	49.23	53.03	49.55	45.61
Unspecified mix of HFCs and PFCs	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NO,NA	0.00
Emissions of SF_6 - (kt CO_2 eq)	335.87	307.35	311.88	304.87	312.96	309.35	-34.27
SF_6	0.01	0.01	0.01	0.01	0.01	0.01	-34.27
Emissions of NF_3 - (kt CO_2 eq)	4.12	4.10	8.56	9.75	10.56	13.46	100.00
NF_3	0.00	0.00	0.00	0.00	0.00	0.00	100.00

CRF Table10s6

GREENHOUSE GAS EMISSIONS	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
	CO_2 equivalent (kt)									
CO_2 emissions without net CO_2 from LULUCF	62292.97	65900.42	60432.20	60788.48	61191.09	64206.70	67674.01	67454.13	67054.86	65702.17
CO_2 emissions with net CO_2 from LULUCF	49986.36	48951.42	48433.86	48429.69	48910.01	50633.33	56656.27	48063.64	49533.50	46051.80
CH_4 emissions without CH_4 from LULUCF	10514.20	10415.39	10121.88	10023.83	9728.83	9639.50	9358.21	8981.45	8803.10	8627.57
CH_4 emissions with CH_4 from LULUCF	10538.45	10439.30	10145.97	10047.88	9752.75	9663.36	9382.07	9005.28	8827.10	8651.38
N_2O emissions without N_2O from LULUCF	4341.65	4504.38	4198.11	4112.56	4322.33	4425.44	4316.71	4341.33	4388.31	4376.79
N_2O emissions with N_2O from LULUCF	4485.37	4650.05	4346.16	4262.84	4470.42	4570.37	4458.54	4480.03	4524.03	4511.37
HFCs	2.44	3.89	5.64	235.26	261.11	353.45	417.20	498.14	608.55	700.92
PFCs	1182.79	1192.62	510.47	63.52	70.96	83.35	80.25	117.47	55.53	79.18
Unspecified mix of HFCs and PFCs	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
SF_6	470.61	614.14	656.27	744.00	926.17	1100.11	1176.90	1086.40	869.88	676.37
NF_3	NO,NA	NO,NA	NO,NA	NO,NA	0.76	6.44	7.93	15.53	9.43	8.24
Total (without LULUCF)	78804.65	82630.84	75924.58	75967.67	76501.24	79814.98	83031.22	82494.45	81789.67	80171.24
Total (with LULUCF)	66666.02	65851.42	64098.37	63783.20	64392.17	66410.41	72179.15	63266.49	64428.02	60679.26
Total (without LULUCF, with indirect)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total (with LULUCF, with indirect)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
	CO_2 equivalent (kt)									
1. Energy	53027.67	56724.75	52137.54	52394.83	52038.93	54520.01	58721.70	57218.94	57020.90	55847.12
2. Industrial processes and product use	13663.04	13696.32	12054.17	12004.75	12739.49	13605.67	13057.24	14220.14	13865.42	13647.28
3. Agriculture	8188.91	8215.46	7786.47	7647.10	7899.66	8038.15	7789.59	7740.53	7708.47	7601.56
4. Land use, land-use change and forestry[5]	-12138.63	-16779.42	-11826.21	-12184.47	-12109.07	-13404.57	-10852.07	-19227.96	-17361.64	-19491.98
5. Waste	3925.02	3994.31	3946.41	3920.98	3823.16	3651.16	3462.69	3314.84	3194.88	3075.28
6. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Total (including LULUCF)[5]	66666.02	65851.42	64098.37	63783.20	64392.17	66410.41	72179.15	63266.49	64428.02	60679.26

CRF Table10s6 continued

GREENHOUSE GAS EMISSIONS	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
	CO_2 equivalent (kt)									
CO_2 emissions without net CO_2 from LULUCF	66345.61	70456.72	72198.85	77861.16	78164.64	79369.26	76683.54	74028.29	73805.19	67645.52
CO_2 emissions with net CO_2 from LULUCF	49961.46	51144.10	57742.33	72802.95	68746.03	68483.02	71148.52	68151.47	69129.30	63094.88
CH_4 emissions without CH_4 from LULUCF	8447.35	8278.10	8125.42	8055.65	8049.86	7808.39	7673.99	7547.24	7409.83	7312.93
CH_4 emissions with CH_4 from LULUCF	8471.23	8301.95	8149.66	8079.87	8073.69	7832.25	7697.95	7571.11	7433.73	7336.85
N_2O emissions without N_2O from LULUCF	4354.05	4230.27	4231.96	4221.19	3632.99	3633.13	3629.61	3644.21	3824.42	3599.13
N_2O emissions with N_2O from LULUCF	4487.69	4362.90	4364.21	4352.85	3763.30	3762.67	3759.24	3773.85	3955.15	3730.25
HFCs	713.63	863.10	968.78	1072.19	1158.34	1145.81	1152.47	1195.89	1248.53	1308.77
PFCs	87.87	116.34	101.97	126.38	157.57	163.29	172.39	230.33	208.19	36.02
Unspecified mix of HFCs and PFCs	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
SF_6	574.53	629.33	613.30	549.44	484.01	493.63	453.46	367.01	373.43	341.68
NF_3	10.51	10.51	10.51	21.56	26.54	28.16	32.73	59.39	53.47	4.54
Total (without LULUCF)	80533.54	84584.37	86250.80	91907.59	91673.96	92641.65	89798.19	87072.36	86923.07	80248.60
Total (with LULUCF)	64306.92	65428.22	71950.76	87005.24	82409.48	81908.82	84416.76	81349.05	82401.80	75853.00
Total (without LULUCF, with indirect)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total (with LULUCF, with indirect)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
	CO_2 equivalent (kt)									
1. Energy	55421.96	59746.49	60884.97	66544.49	66710.53	67134.34	63798.13	60470.06	59992.46	56770.71
2. Industrial processes and product use	14642.04	14523.42	15166.23	15307.79	14863.46	15612.47	16251.69	16940.67	17273.78	13948.38
3. Agriculture	7506.43	7448.97	7336.49	7188.72	7170.01	7103.85	7077.16	7118.30	7225.72	7244.78
4. Land use, land-use change and forestry[5]	-16226.62	-19156.15	-14300.04	-4902.35	-9264.47	-10732.83	-5381.43	-5723.31	-4521.27	-4395.60
5. Waste	2963.11	2865.49	2863.10	2866.58	2929.96	2790.99	2671.21	2543.33	2431.10	2284.73
6. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Total (including LULUCF)[5]	64306.92	65428.22	71950.76	87005.24	82409.48	81908.82	84416.76	81349.05	82401.80	75853.00

CRF Table10s6 continued

GREENHOUSE GAS EMISSIONS	2010	2011	2012	2013	2014	2015	Change from base to latest reported year
	CO_2 equivalent (kt)						(%)
CO_2 emissions without net CO_2 from LULUCF	72547.42	70286.77	67721.10	67956.09	64204.37	66724.17	7.11
CO_2 emissions with net CO_2 from LULUCF	66505.25	63945.09	61932.90	63288.02	59164.40	61743.97	23.52
CH_4 emissions without CH_4 from LULUCF	7210.77	7000.09	6883.49	6787.91	6649.73	6574.96	-37.47
CH_4 emissions with CH_4 from LULUCF	7234.67	7023.98	6907.40	6811.91	6673.65	6599.07	-37.38
N_2O emissions without N_2O from LULUCF	3399.35	3488.99	3449.43	3439.51	3507.49	3517.27	-18.99
N_2O emissions with N_2O from LULUCF	3530.51	3619.80	3580.65	3570.14	3638.06	3649.69	-18.63
HFCs	1483.45	1536.09	1612.75	1602.88	1643.19	1662.04	68084.68
PFCs	78.05	73.51	50.72	49.23	53.03	49.55	-95.81
Unspecified mix of HFCs and PFCs	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NO,NA	0.00
SF_6	335.87	307.35	311.88	304.87	312.96	309.35	-34.27
NF_3	4.12	4.10	8.56	9.75	10.56	13.46	100.00
Total (without LULUCF)	85059.02	82696.89	80037.93	80150.24	76381.33	78850.81	0.06
Total (with LULUCF)	79171.92	76509.92	74404.87	75636.80	71495.84	74027.14	11.04
Total (without LULUCF, with indirect)	NA	NA	NA	NA	NA	NA	0.00
Total (with LULUCF, with indirect)	NA	NA	NA	NA	NA	NA	0.00

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	2010	2011	2012	2013	2014	2015	Change from base to latest reported year
	CO_2 equivalent (kt)						(%)
1. Energy	59880.50	57423.56	55321.00	55284.55	51325.78	53350.86	0.61
2. Industrial processes and product use	15926.15	16084.57	15697.25	15978.01	16133.37	16676.38	22.05
3. Agriculture	7094.42	7146.13	7077.38	7059.12	7183.51	7167.99	-12.47
4. Land use, land-use change and forestry[5]	-5887.10	-6186.97	-5633.06	-4513.44	-4885.49	-4823.67	-60.26
5. Waste	2157.95	2042.63	1942.30	1828.55	1738.67	1655.58	-57.82
6. Other	NO	NO	NO	NO	NO	NO	0.00
Total (including LULUCF)[5]	79171.92	76509.92	74404.87	75636.80	71495.84	74027.14	11.04

Annex C

Projections – supplementary information

Sectoral activity data and parameters

Parameter used ('with existing measures' scenario)	Default unit	2015	2020	2025	2030	2035
Population	Count	8,620,822	8,939,242	9,155,847	9,313,617	9,432,401
GDP: Real growth rate	%	1.0%	1.6%	1.6%	1.5%	1.6%
GDP: Constant prices (2010)	EUR million	335,083	359,568	388,458	419,495	453,639
Gross value added (GVA) total industry	EUR million	51,697	57,350	63,380	69,321	75,311
Exchange rates US DOLLAR	USD/EUR	1.1	1.2	1.2	1.2	1.2
EU ETS carbon price	EUR/EUA	8	15	20	27	37
Intl. fuel import prices: Electricity Coal	EUR/GJ	2	2	3	3	3
Intl. fuel import prices: Crude Oil	EUR/GJ	8	12	14	15	16
Intl. fuel import prices: Natural gas	EUR/GJ	6	8	8	9	10
Energy parameters						
Natl. retail fuel prices: Coal, industry	EUR/GJ	6	7	8	10	11
Natl. retail fuel prices: Coal, households	EUR/GJ	10	12	15	18	21
Natl. retail fuel prices : Heating oil, industry	EUR/GJ	12	15	18	20	23
Natl. retail fuel prices: Heating oil, households	EUR/GJ	19	23	27	31	34
Natl. retail fuel prices : Transport, gasoline	EUR/GJ	37	50	60	68	76
Natl. retail fuel prices : Transport, diesel	EUR/GJ	31	43	51	59	66
Natl. retail fuel prices : Natural gas, industry	EUR/GJ	10	12	14	16	19
Natl. retail fuel prices : Natural gas, households	EUR/GJ	19	23	27	31	36
Natl. retail electricity prices : Industry	EUR/kWh	0.10	0.09	0.10	0.11	0.12
Natl. retail electricity prices : Households	EUR/kWh	0.19	0.17	0.19	0.21	0.24
Gross inland consumption: solid fuels	GJ	135,702	111,729	103,591	99,967	99,842
Gross inland consumption: petroleum products	GJ	508,131	494,084	479,848	459,512	438,500
Gross inland consumption: gas	GJ	287,931	282,987	282,089	277,439	263,129
Gross inland consumption: Renewables	GJ	411,150	445,714	461,705	472,339	481,154
Gross inland consumption: Nuclear	GJ	NO	NO	NO	NO	NO
Gross inland consumption: Other	GJ	66,583	45,601	43,343	43,351	49,983
Gross inland consumption: Total	GJ	1,409,496	1,380,115	1,370,576	1,352,607	1,332,608
Gross electricity production: Coal	TWh	5	3	2	2	2
Gross electricity production: Oil	TWh	1	0	0	0	0
Gross electricity production: Natural gas	TWh	8	6	6	6	5
Gross electricity production: Renewables	TWh	47	57	60	63	66
Gross electricity production: Nuclear	TWh	NO	NO	NO	NO	NO
Gross electricity production: Other	TWh	1	1	1	1	1
Gross electricity production: Total	TWh	62	68	70	73	74
Total net electricity imports	TWh	11	4	4	5	7
Gross final energy consumption	GJ	1,169,667	1,181,000	1,177,936	1,164,658	1,149,875
Final energy consumption: Industry	GJ	300,126	301,388	308,178	312,407	317,068
Final energy consumption: Transport	GJ	403,021	400,731	403,405	399,925	394,069

Final energy consumption: Residential	GJ	255,246	266,973	257,150	246,686	235,391
Final energy consumption: Agric./Forestry	GJ	13,268	12,374	12,252	12,471	12,951
Final energy consumption: Services	GJ	115,402	108,209	106,133	102,706	99,626
Final energy consumption: Other	GJ	NO	NO	NO	NO	NO
Final energy consumption: Total	GJ	1,087,062	1,089,676	1,087,119	1,074,196	1,059,105
Number of heating degree days (HDD)	Count	3,238	3,204	3,171	3,118	3,065
Number of cooling degree days (CDD)	Count	153	153	157	162	170
Transport parameters						
Number of passenger-kilometres (total)	million pkm	115,822	119,191	122,905	126,680	131,132
Freight transport tonnes-kilometres (total)	million tkm	170,813	171,469	185,693	201,700	216,376
Final energy demand for road transport	GJ	322,362	324,489	321,966	309,427	292,754
Buildings parameters						
Number of households	Count	3,798,285	3,988,901	4,123,738	4,226,339	4,313,944
Household size	inhabitants	2.27	2.24	2.22	2.20	2.19
Agriculture parameters						
Livestock: Dairy cattle	1000 heads	534	538	553	569	593
Livestock: Non-dairy cattle	1000 heads	1,424	1,387	1,315	1,243	1,271
Livestock: Sheep	1000 heads	354	321	284	246	245
Livestock: Pig	1000 heads	2,845	3,008	3,204	3,401	3,439
Livestock: Poultry	1000 heads	15,772	14,563	12,549	10,535	9,853
Nitrogen input from synthetic fertilizers	kt nitrogen	121	119	109	99	94
Nitrogen input from application of manure	kt nitrogen	132	132	135	137	141
Nitrogen fixed by N-fixing crops	kt nitrogen	IE	IE	IE	IE	IE
Nitrogen in crop residues returned to soils	kt nitrogen	75	80	79	78	78
Area of cultivated organic soils	Ha (hectares)	12,954	12,954	12,954	12,954	12,954
Waste parameters						
Municipal solid waste (MSW) generation	tonne MSW	NA	NA	NA	NA	NA
MSW going to landfills	tonne MSW	131,959	134,756	118,702	118,702	118,702
Share of CH4 recovery in total CH4 from landfills	%	8.3%	6.7%	5.1%	3.5%	1.9%

Model description

Model name	DYNK
Full model name	Dynamic New Keynesian Model
Model version and status	2016
Latest date of revision	2016
URL to model description	http://www.foreurope.eu/fileadmin/documents/pdf/Deliverables/WWWforEurope_DEL_no05_D205.1.pdf
Model type	dynamic econometric energy model
Model description	The DYNK model covers 62 NACE 2008 2-digit sectors and five income groups of households and has similar features to a DSGE model. The model solution converges towards a long-run full employment equilibrium, but exhibits short-run institutional rigidities (imperfect credit and capital markets, wage bargaining). The DYNK model links physical energy and material flow data to production and consumption activities. Different sources of technical change are modelled at the disaggregate level: TFP, factor-bias and material efficiency in production and energy efficiency in private consumption. These components of technical change drive – together with relative prices – economic growth and resource use and therefore decoupling. It is a Top-Down Model using economic structures (Supply and Use tables) at its core and derives energy demands of the 62 sectors as well as the household sector in relations to energy prices, technical and socio-demographic variables such as stock of dwellings and energy efficiency explaining economic developments. The DYNK model is linked to three partial bottom-up models of other research groups, which describe the heating system, electricity demand and power generation and the transport sector. Scenario results are presented according to the template of the aggregated energy balance of Statistics Austria with regard to the with-existing-measures (WEM) scenario.
Summary	-
Intended field of application	energy projection
Main input data categories	GDP, energy balance, energy and carbon prices, population
Validation and evaluation	-
Output quantities	energy in TJ / kWh, monetary in Euro
GHG covered	only fuels
Sectoral coverage	all energy sectors
Geographical coverage	Austria
Temporal coverage	2012-2050 (yearly)
Interface with other models	yes, with TIMES, INVERT/EE-Lab and NEMO & GEORG
Input from other models	dwelling stock, heating demand, private heating system types, heating efficiency, vehicle type stock, vehicle efficiency, bio-fuel share, power generation

Model name	TIMES - Österreich Modell
Full model name	The Integrated MARKAL-EFOM-System
Model version and status	2015
Latest date of revision	2015
URL to model description	http://www.energyagency.at/projekte-forschung/energiewirtschaft-infrastruktur/detail/artikel/energiewirtschaftlicher-szenarien-fuer-das-klimaschutzgesetz-und-zur-erfuellung-der-oesterreichische.html
Model type	Demand driven linear optimisation model
Model description	The TIMES - Österreich Modell models the energy flow from primary energy to energy sectors, by using top-down and technology-rich bottom-up approaches. It is a perfect-foresight model that aims at minimising the total system costs (and thus maximising the consumer surplus) based on given energy resources and potentials, available technologies, demand developments and other technical-economic constraints.
Summary	-
Intended field of application	Development of sectoral or national energy scenarios
Main input data categories	From the national statistical office: Energy balances; Household statistics; useful energy analysis; Reports from the energy regulator;
Validation and evaluation	-
Output quantities	Main output: energy flows (TJ), capacities (MW)
GHG covered	Not in this application
Sectoral coverage	In this application, only the activities of the energy sector and the electricity demand of selected demand sectors and applications are calculated.
Geographical coverage	Austria
Temporal coverage	Yearly, from 2007 to 2050
Interface with other models	no
Input from other models	District heating from INVERT/EE LAB and DEIO; electricity for transport from GLOBEMI
Model structure	Main sectors: Upstream, Power&Heat, Residential, Services, Industry, Agriculture, Transport; Energy carriers: accroding to the structure of the national energy balances

Model name	Invert / EE-Lab by Vienna Technical University
Full model name	Invert / EE-Lab
Model version and status	2.0.EEG_2618
Latest date of revision	Nov.16
URL to model description	www.invert.at
Model type	Engineering-based bottom-up simulation model augemented by statistical bottom-up and top-down parameters
Model description	Invert/EE-Lab is a dynamic engineering-based bottom-up simulation tool, augmented by statistical bottom-up and top-down elements. The model endogenously evaluated (1) construction, renovation and demolition activities and (2) investment decision-making processes renovation measures and heating systems replacement, applying a nested logit approach and (3) considers different types diffusion restrictions. The Invert/EE-Lab model is capable of evaluating the effects of different policy instruments (in particular different settings of economic and regulatory incentives) on the energy carrier mix, CO2 reductions and costs for RES-H support policies. Furthermore, Invert/EE-Lab is designed to simulate different scenarios (price scenarios, insulation scenarios, different consumer behaviours, etc.) and their respective impact on future trends of renewable as well as conventional energy sources on a national and regional level. Invert simulation tool originally has been developed by Vienna University of Technology/EEG in the frame of the Altener project Invert (Investing in RES&RUE technologies: models for saving public money). During several projects and studies the model has been extended and applied to different regions within. In 2010, the developement of the Invert/EE-Lab model started, included a re-programming process and accommodation of the tool, in particular taking into account the inhomogeneous structure of decision makers in the building sector and corresponding distributions. The core of the tool is a myopical, nested logit approach, which optimizes objectives of “agents” under imperfect information conditions and by that represents the decisions maker concerning building related decisions. Invert/EE-Lab models the stock of buildings in a highly disaggregated manner. The latest model extension is the agent-based simulation module which allows to definie investor types with different properties, perceptions and decision criteria.
Summary	Invert/EE-Lab is a dynamic engineering-based bottom-up simulation tool, augmented by statistical bottom-up and top-down elements that evaluates the effects of different policy instruments (in particular different settings of economic and regulatory incentives) on the energy carrier mix, CO2 reductions and costs for RES-H support policies. Furthermore, Invert/EE-Lab is designed to simulate different scenarios (price scenarios, insulation scenarios, different consumer behaviours, etc.) and their respective impact on future trends of renewable as well as conventional energy sources on a national and regional level.
Intended field of application	Heating and cooling needs and associated final energy demand per energy carriers and deliverd energy of building sector
Main input data categories	Building typology, techno-economic data on heating technologies and efficiency data, decision behauvior variables and investment agents, policy instrument designs
Validation and evaluation	Müller, A., Kranzl, L., Hummel, M., Toleikyte, A., Neusser, M., Gladt, M., Bednar, T., Schicker, I., Formayer, H., 2014a. Impact of climate change on heating and cooling demand in buildings: analysis of the Austrian case. Vienna University of Technology, Vienna.
Output quantities	Energy demand for space heating, domestic hot water, space cooling disaggregated by energy carriers, building types,
GHG covered	GHG emmissions of space heating, domestic hot water and space cooling
Sectoral coverage	Buildings in households and service sector
Geographical coverage	EU 28, Swiss, Norway, Serbia, Iceland
Temporal coverage	2008 - 2050, yearly timespeps

Model name	NEMO
Full model name	Network Emission Model
Model version and status	NEMO Version 4.0.0
Latest date of revision	12.10.2016
URL to model description	-
Model type	„Meso-scale“ emission model (emission behaviour simulated based on engine load dependent characteristics, cycle average engine power calculated from vehicle specifications and cycle average kinematics)
Model description	From the submission in 2017 (1990-2015) onwards calculations are based on the model NEMO - Network Emission Model (DIPPOLD/REXEIS/HAUSBERGER 2012; HAUSBERGER/ SCHWINGSHACKL/ REXEIS 2015a, 2015b). The model NEMO (Network Emission Model) was developed at the Institute for Internal Combustion Engines and Thermodynamics (IVT) at the Graz University of Technology (TUG) as tool for the simulation of traffic related emissions in road networks. Typical applications reach from emission inventories for cities, regions and countries to complex measures like environmental zones or promotion of alternative propulsion systems. An interface to makro scale traffic models, such as VISUM and to air quality modelling is available. NEMO combines both detailed calculation of the vehicle fleet composition and simulation of emission factors on a vehicle level. NEMO calculates the percentages of different vehicle layers on the overall traffic volume as a function of year and considered road type based on data on vehicle stock, composition of new registrations and vehicle usage. The simulation of the emissions of the different vehicle layers is based on the correlation of the specific engine emission behaviour (emissions in grams per kilowatt-hour engine work) with the cycle average engine power in a normalised format. The calculation of the required engine power is based on average speed and additional kinematic parameters for the description of the cycle dynamics for a given road section. Compared to more detailed instantaneous emission models - which are usually based on simulation in 1Hz time resolution – this simplified approach gives no disadvantage for the modelling of emissions on large street networks as in most of the cases 1Hz data for vehicle operation are not available. An additional benefit of the NEMO simulation approach is the short computing time. It is fully capable to depict the upcoming variety of possible combinations of propulsion systems (internal combustion engine, hybrid, plug-in-hybrid, electric propulsion, fuel cell …) and alternative fuels (CNG, biogas, FAME, Ethanol, GTL, BTL, H2 …). In addition, NEMO has been designed to be suitable for all main application fields of simulation of energy consumption and emission output on a road-section based model approach. As there exists not yet a complete road network for Austria on a highly resolved spatial level, the old methodology based on a categorisation of the traffic activity into “urban”, “rural” and “motorway” has been applied in NEMO at the moment.
Summary	-
Intended field of application	National Inventories, regional road specific
Main input data categories	The parameterisation of NEMO is based on data from European in-use measurements which are also used for the Handbook Emission Factors of Road Transport (HBEFA, 2010). NEMO is updated regularly according to recent data on emission behaviour and vehicle technologies. All on-road vehicle categories are covered; a tool for the transport sectors rail and inland waterway shipping is also available. NEMO is equipped with a Graphical User Interface which allows for efficient data editing, scenario handling and display of model results. 1) Vehicle stock 2) Emission factors 3) Optional either/or • total gasoline and diesel consumption of the area under consideration, • average km per vehicle and year.
Validation and evaluation	DIPPOLD, M., REXEIS, M., HAUSBERGER, S. (2012): NEMO – A Universal and Flexible Model for Assessment of Emissions on Road Networks. 19th International Conference “Transport and Air Pollution“, 26. – 27.11.2012, Thessaloniki.
Output quantities	a) total fuel consumption b) Total vehicle mileages c) Total passenger-km and ton-km d) Specific emission values for the vehicle fleets [g/km], [g/t-km], [g/pass-km] e) Total emissions and energy consumption of the road transport (fc, CO, HC, NOx, particulate matter, CO2, SO2 and several unregulated pollutants among them CH4 and N2O).
GHG covered	CO2, CH4, N2O
Sectoral coverage	1 A 3 b Road Transport
Geographical coverage	Austria
Temporal coverage	1950-2015 inventory, 2016 - 2050 projections
Interface with other models	PHEM, GEORG, possible VISUM or other macro scale trafic models
Input from other models	PHEM

Model name	GEORG
Full model name	Grazer Emissionsmodell für Off Road Geräte (Global Emission model for Off Road, Graz)
Model version and status	GEORG Version mit Visual Basic Programmierung, 2014
Latest date of revision	06.11.2015
URL to model description	-
Model type	Makro-Sscale model for off road machinery based on emission factors [g/kWh] and average load profiles
Model description	Energy and emission calculation model for off-road machinery
Summary	Energy and emission calculation model for off-road machinery
Intended field of application	off-road
Main input data categ./sources	vehicle stock of all machinery categories specific use time as a function of age in [h / year] average engine power in operation specific emission rate of the emission standard [g / kWh]
Validation and evaluation	HAUSBERGER, S.: Emissionen des Off-Road-Verkehrs im Bundesgebiet Österreich für die Bezugsjahre 1990 bis 1999; im Auftrag der Umweltbundesamt GmbH, Graz-Wien, Dez. 2000. HAUSBERGER, S. SCHWINGSHACKL, M. & REXEIS, M. (2015a): Straßenverkehrsemissionen und Emissionen sonstiger mobiler Quellen Österreichs für die Jahre 1990 bis 2013. FVT – Forschungsgesellschaft für Verbrennungskraftmaschinen und Ther-modynamik mbH. Erstellt im Auftrag der Umweltbundesamt GmbH. Graz 2015.
Output quantities	energy (GWh/year), emissions (kt/year)
GHG covered	CO2, CH4, N2O
Sectoral coverage	off-road machinery in agriculture and forestry, households and industrs; navigation (excl. Danube navigation); military (excl. military aviation)
Geographical coverage	Austria
Temporal coverage	1990-2015 / 2016 -2050 projections
Interface with other models	NEMO (Excel result)
Input from other models	NEMO-Ship

Model name	MARS Austria
Full model name	Metropolitan Activity Relocation Simulator for Austria - A strategic, dynamic land use and transport interaction model
Model version and status	-
Latest date of revision	2016
URL to model description	http://www.ivv.tuwien.ac.at/forschung/mars-metropolitan-activity-relocation-simulator/overview/
Model type	MARS is a strategic and dynamic Land-Use and Transport Interaction (LUTI) model.
Model description	The MARS model consists of sub models which simulate passenger transport, housing development, household migration and workplace migration; additionally accounting modules calculate assessment indicators and pollutant emissions. The overall structure of the model is shown in 'Model structure'. The main link between the transport model and the location choice model are accessibilities (formulated as potential to reach workplaces and shopping opportunities), which are passed on from the transport model to the location choice models and the spatial distribution of households and employment which are input from the location choice models to the transport model. The land price influences both the residential location- and the workplace sub model whereas these two sum models change the availability of land.
Summary	MARS Austria is a national system dynamics land-use/transport interaction model, applied for the whole territory of Austria with model zones mapping the level of the 120 Austrian districts (98 'Politische Bezirke' plus the 23 municipal districts of the capital Vienna). The model is design to capture the most important interrelations between transport, land-use and the economy; to this end, the mechanisms im-plemented in the model simulate passenger transport and the spatial distribution of residents and workplaces.
Intended field of application	The rather high aggregated integrated, dynamic urban land use and transport model MARS was developed as the core of a sustainability assessment framework.
Main input data categ./sources	http://www.ivv.tuwien.ac.at/forschung/mars-metropolitan-activity-relocation-simulator/data-requirements/
Validation and evaluation	http://www.ivv.tuwien.ac.at/forschung/mars-metropolitan-activity-relocation-simulator/references/
Output quantities	modal share of walking, cycling, Public transport, motorized transport; dricing performance, trip length distribution, fleet development, energy use, GHG and air pollutant emissions
GHG covered	yes
Sectoral coverage	passenger transport; land-use
Geographical coverage	Austria NUTS-3, several cities world wide
Temporal coverage	can be freely chosen dependent on input data
Interface with other models	MSExcel as Input and Output; Output for any transport asignment model
Input from other models	Calibration parameters, Base year data and Data for the time-dependent definition of future scenarios. For example: Population development from the Austrian Conference on Spatial Planning - ÖROK; GDP development, Prices development

Model name	PASMA
Full model name	Positive agricultural sector model of Austria
Model version and status	model developed in 2003 and continuously enhanced since then; most recently amended in 2015
Latest date of revision	2015
URL to model description	http://franz.sinabell.wifo.ac.at/papers/WP_2007_288$.PDF
Model type	programming model (PMP method)
Model description	The Positive Agricultural Sector Model Austria (PASMA) is employed to estimate the impact of farm policy measures on the supply of the agricultural sector in Austria. PASMA depicts the political, natural, and structural complexity of Austrian farming in detail and was used for a number of policy evaluation studies. Data from the Integrated Administration and Control System (IACS), Economic Agricultural Account (EAA), Agricultural Structural Census (ASC), Farm Accountancy Data Network (FADN), the Standard Gross Margin Catalogue, and the Standard Farm Labour Estimates provide necessary information on resource and production endowments for 40 regional and structural (i.e. alpine farming zones) production units in Austria. Consequently, PASMA is capable to estimate production, labour, income, and environmental responses for each single unit.
Summary	PASMA is the model most frequently used in applied agricultural policy analysis and market analysis in Austria.
Intended field of application	farm policy analysis, market analysis and farm income analysis, environmental impact assesments
Main input data categ./sources	IACS, EAAE, agricultural census, standard gross margins, standard farm labour survey, price and production statistics of Statistic Austria, price forecasts of OECD-FAO
Validation and evaluation	no independent full range validation so far; validation of results on environment: Sinabell F. and E. Schmid, 2011, Environmental consequences in Austria of the 2003 CAP reform. In: OECD (Ed.), Disaggregated Impacts of CAP Reforms, OECD, Paris., 235-250, 2011.; evaluation in Britz and Heckelei, 2008, Recent developments in EU policies - challenges for partial equilibrium models.Paper prepared for presentation at the 107th EAAE Seminar "Modeling of Agricultural and Rural Development Policies". Sevilla, Spain, January 29 th -February 1 st, 2008.
Output quantities	all EAAE outputs and mineral balances
GHG covered	none
Sectoral coverage	agricultural sector
Geographical coverage	Austria, NUTS3-level
Temporal coverage	time steps: annual; base period and projection period con be freely chosen
Interface with other models	interface with MULTIREG (regional / sectoral general equilibrium model of Austria)
Input from other models	prices of farm commodities and costs of inputs

Appendix D

Summary of Reporting according to the Kyoto Protocol

Table D.1 Summary of reporting of the supplementary information under Article 7, paragraph 2, of the Kyoto Protocol in the NC6

Information reported under Article 7, paragraph 2	NC7 section
National systems in accordance with Article 5, paragraph 1	3.3
National registries	3.4
Supplementarity relating to the Mechanisms pursuant to Articles 6, 12, 17	5.4
Policies and measures in accordance with Article 2	4.3
Domestic and regional programmes and/or legislative arrangements and enforcement and administrative procedures	4.2
Information under Article 10:	
Article 10a	3.3
Article 10b	4.2, 6.3
Article 10c	7.2
Article 10d	8
Article 10e	9
Financial resources	7

Appendix E

Abbreviations, Terms and Units of Measurement

Abbreviations and Terms

BSRN	Baseline Surface Radiation Network
CHP	combined heat and power
ETS	(EU) Emissions Trading Scheme
GAW	Global Atmosphere Watch
GCM	global circulation model
GDP	gross domestic product
GEF	Global Environment Facility
GRDC	Global Runoff Data Centre
GSN	GCOS Surface Network
GUAN	GCOS Upper-air Network
KLIEN	Klima- und Energiefonds (Austrian Climate and Energy Fund)
KPC	Kommunalkredit Public Consulting
Land	Federal Province of Austria
Länder	Federal Provinces of Austria
LTER	Long-term ecological research
NDACC	Network for Detection of Atmospheric Composition Change
ODA	Official Development Assistance
pkm	passenger kilometres
tkm	tonne kilometres
USD	United States Dollar
WDCGG	World Data Centre for Greenhouse Gases
WWW	World Weather Watch
WOUDC	World Ozone and Ultraviolet Radiation Data Centre
ZAMG	Zentralanstalt für Meteorologie und Geodynamik (Central Institute for Meteorology and Geodynamics, Met Austria)

Units of Measurement

k…	kilo (10^3)
M…	Mega (10^6)
G...	Giga (10^9)
T…	Tera (10^{12})
P...	Peta (10^{15})
g	gramme
t	(metrical) ton
J	joule
ha	hectares
.../a	per year
.../d	per day