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Preface

This third *OECD Environmental Performance Review of Austria* assesses progress achieved since the last review, which was carried out in 2003, as well as remaining challenges. It shows that Austria's experience provides many valuable lessons for countries promoting green growth and sustainable development.

Austria has indeed often played a leading role in developing EU environmental legislation, and performs above average in its implementation. As a result, environmental quality is generally very good, and citizens are relatively satisfied with their environmental quality of life. Water quality is among the best in the world, a large share of the land is under some form of nature protection, and the carbon, energy and resource intensities of the economy have declined. Nevertheless, in some areas such as greenhouse gas emissions, air quality and biodiversity, progress has not been sufficient to reach domestic and international objectives.

The combination of a robust environmental policy framework and substantial financial assistance has fostered the development of a strong, innovative environmental goods and services sector. In 2011, this sector contributed almost twice as much to GDP as tourism. Austria has also made greater use of taxes and other economic instruments to reach environmental objectives, although the potential synergies among instruments have not been fully realised. Subsidies, mainly related to energy and vehicle use, have a potentially negative impact on the environment and are socially regressive. The partial law-making and implementation autonomy of the *Länder* has led to some inconsistencies in implementation and enforcement. Going forward, further efforts are needed to enhance the coherence and effectiveness of existing policies.

This *Review* presents 27 recommendations with a special emphasis on adaptation to climate change, chemicals management and green growth. The focus on adaptation to climate change and natural hazards is particularly pertinent in light of the devastating floods that occurred in Austria in June 2013. The *Review* recommends, for example, to further mainstream climate change adaptation at an early stage in government policies and to allocate sufficient financial resources for it, while exploring the possible role of private finance, insurance markets and public-private partnerships. It also calls for providing more targeted support to small- and medium-sized enterprises to assist them to comply with obligations under EU chemicals regulations.

The *Review* also recommends to extend the use of environmentally related taxes in the framework of a comprehensive socio-environmental tax reform. Moreover, it calls for analysing the potentially negative environmental impacts of existing subsidies and reducing perverse incentives for car use, while systematically evaluating the cost-effectiveness of environmental support measures at the federal and subnational levels.

This *Review* is the result of a constructive policy dialogue between Austria and the other members and observers of the OECD Working Party on Environmental Performance. I am confident that this collaborative effort will help to improve our understanding of how to tackle the many shared environmental challenges faced by OECD members and its partner countries.

Angel Gurría
OECD Secretary-General

Foreword

The principal aim of the OECD Environmental Performance Review programme is to help member and selected partner countries improve their individual and collective performance in environmental management by:

- *helping individual governments assess progress in achieving their environmental goals;*
- *promoting continuous policy dialogue and peer learning;*
- *stimulating greater accountability from governments towards each other and public opinion.*

This report reviews the environmental performance of Austria since the previous OECD Environmental Performance Review *in 2003. Progress in achieving domestic objectives and international commitments provides the basis for assessing the country's environmental performance. Such objectives and commitments may be broad aims, qualitative goals or quantitative targets. A distinction is made between intentions, actions and results. Assessment of environmental performance is also placed within the context of Austria's historical environmental record, present state of the environment, physical endowment in natural resources, economic conditions and demographic trends.*

The OECD is indebted to the government of Austria for its co-operation in providing information, for the organisation of the review mission to Vienna and Graz (17-22 September 2012), and for facilitating contacts both inside and outside government institutions.

Thanks are also due to all those who helped in the course of this review, to the representatives of member countries participating in the OECD Working Party on Environmental Performance and especially to the examining countries: Finland and Switzerland. The team that prepared this review comprised experts from reviewing countries: Mr Esa Nikunen (Finland) and Mr Thomas Probst (Switzerland); members of the OECD Secretariat: Ms Ivana Capozza, Mr Brendan Gillespie, Mr Reo Kawamura, Mr Michael Mullan; and Mr Bill Kennedy and Ms Dian Turnheim (consultants). Ms Carla Bertuzzi and Ms Elvira Berrueta-Imaz (OECD Secretariat) and Ms Rebecca Brite (consultant) provided statistical and editorial support during the preparation of the report. Preparation of this report also benefitted from inputs and comments provided by Mr Ralf Aschermann (University of Graz), Ms Nicola Brandt, Ms Eva Hübner and other members of the OECD Secretariat.

The OECD Working Party on Environmental Performance discussed the draft Environmental Performance Review of Austria *at its meeting on 3 June 2013 in Paris, and approved the Assessment and Recommendations.*

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General notes

Signs

The following signs are used in figures and tables:

. . : not available

– : nil or negligible

. : decimal point

Country aggregates

OECD Europe: This zone includes all European member countries of the OECD, i.e. Austria, Belgium, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, the Netherlands, Norway, Poland, Portugal, the Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

OECD: This zone includes all member countries of the OECD, i.e. the countries of OECD Europe plus Australia, Canada, Chile, Israel,* Japan, Korea, Mexico, New Zealand and the United States.

Country aggregates may include Secretariat estimates.

Currency

Monetary unit: Euro (EUR).

In 2012, USD 1.00 = EUR 0.78

Cut-off date

This report is based on information and data available up to the end of April 2013.

* The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

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Executive summary

Austria's environmental performance generally meets high standards

Austria's water quality is among the world's best, thanks to the very large share of population connected to high-standard wastewater treatment plants. About 28% of the land area is under some form of nature protection. Nearly a fifth of the agricultural area is under organic farming, the highest share in the EU. This, together with uptake of environment-friendly agricultural practices, has helped reduce the impact of agriculture on the environment, including intensity of fertiliser use and nutrient surplus. Material and resource productivity of the economy has improved. An effective waste management policy has contributed to this result through high and growing rates of material recycling and waste recovery. The carbon intensity of the Austrian economy remains low by international standards, owing to the large use of renewable energy sources and the relatively low energy intensity.

However, some environmental pressures remain of concern

The rate of soil sealing for housing and infrastructure development has outpaced population growth and the national target, putting pressure on natural areas and ecosystems. As a large share of the territory is mountainous and forested, the population is concentrated in river valleys and basins, which tend to be prone to natural hazards. Extensive flood protection measures and intensive use of hydropower have exerted ecological pressures on rivers and lakes. Exposure to air pollution in some urban areas is persistently high. Road transport is the major source of air pollution, largely due to the high and increasing share of diesel in the vehicle fleet, urban sprawl and related commuting patterns, and the high volume of international and transit freight traffic. Road transport is also the second largest source of greenhouse gas emissions. Despite a decline, these emissions remain above the 1990 level and Austria's Kyoto target.

Austria has a long history in environmental policy

Austria has established a comprehensive framework for sustainable development. However, despite co-ordination efforts, the coexistence of two sustainability strategies has created uncertainty and hindered effective mainstreaming of sustainable development in policy areas other than environment. Austria compares well with other countries in

contributing to the development of EU environmental legislation and in implementing it. However, the partial law-making and implementation autonomy of the *Länder* has resulted in a relatively fragmented body of environmental legislation, and inconsistencies in implementation and enforcement. Developing a national environmental inspection system could provide the basis for establishing a more level environmental playing field. Austria has a well-developed system to measure environmental performance and well-being, and to assess environmental and other policies, but there is little evidence that assessment and monitoring tools have systematically informed decision making. Austria features extensive stakeholder participation in policy making by means of its unique "social partnership" and active environmental organisations.

Regulations, standards and environmentally motivated subsidies remain at the core of the Austrian environmental policy mix

A long-standing, comprehensive support policy has encouraged environment-friendly investment. However, questions remain about the extent to which such investment would have been made anyway, potential windfall profits, technology lock-in and rebound effects. Fragmented responsibilities between levels of government and lack of co-ordination are also a potential source of inefficiency.

The use of economic instruments such as taxes and charges has been extended

Revenue from environmentally related taxes accounts for a larger share of GDP and total tax receipts than on average in the OECD. However, energy tax rates do not consistently reflect the environmental externalities of fuel use. Tax rates on petrol and diesel are below the EU average, which has contributed to so-called "fuel tourism". While Austria has cut some tax breaks on energy use, other subsidies remain that have a potentially negative impact on the environment and are socially regressive. These include subsidies that encourage ownership and use of private cars and urban sprawl. Austria would benefit from a broad "socio-ecological tax reform" to provide a consistent carbon price signal across the economy, reform environmentally perverse subsidies, reduce the relatively high taxes on labour and promote growth and employment.

Austria has launched several initiatives related to green growth, mostly focused on "green jobs"

The combination of a robust environmental policy framework and substantial financial assistance has fostered the development of a strong environmental goods and service sector (EGS) sector and has put Austria among the most eco-innovative countries. Some evidence exists that the EGS sector has contributed positively to job creation. Austria should broaden the policy focus from promoting green jobs to enhancing labour market capacity to adapt to the structural changes involved in the transition to green growth. In part this would involve co-ordinating policies on environment, labour market and innovation.

Management of the risks associated with chemicals takes place mainly in the framework of EU legislation and policy

Austria has adopted a proactive approach to chemicals policy, both domestically and within the EU, which has also involved promoting "green chemistry" and pioneering chemicals leasing. Inter-institutional co-operation for designing and implementing chemicals legislation is smooth, and co-operation between industry and government is particularly strong. Implementation of the EU Regulation on Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) will be a major challenge for chemical companies in Austria and other EU countries. More could be done to target support to small and medium-sized enterprises and to further streamline administrative requirements. There is scope to strengthen enforcement capacity in the *Länder* and enhance efficiency and effectiveness of inspection activity, and of chemicals management more generally.

Austria has a comprehensive, effective and well-funded system for managing natural hazards, mainly floods

While this provides a good basis for responding to some of the effects of climate change, enhanced co-operation between the federal government and the *Länder* is necessary. Austria's National Adaptation Strategy, approved in 2012, is one of the most comprehensive in the OECD. Its development built on strong domestic research capacity and on extensive stakeholder engagement. There is, however, a need to extend and deepen political and administrative support for climate change adaptation at all levels of government, to clearly define responsibilities and arrangements for implementation, and to establish a robust monitoring and evaluation system. Given pressures on public finances, securing adequate financing is a challenge. It will be important to explore the full range of potential funding sources, including increased recourse to insurance markets and public-private partnerships. At present, neither individuals nor businesses bear the full cost of their exposure to climate risk, which effectively acts as a subsidy for high-risk areas.

PART I

Progress towards sustainable development

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PART I

Chapter 1

Key environmental trends

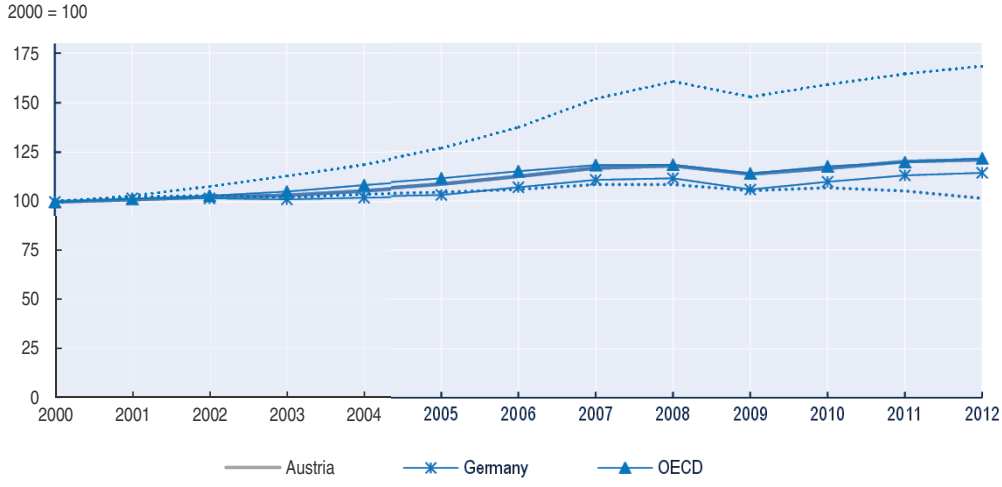
During the 2000s, Austria experienced a robust performance on many economic and social indicators and continued to improve its overall environmental performance. This chapter provides a snapshot of some key environmental trends in Austria over the decade. It highlights some of the main environmental achievements and the remaining challenges on the path towards a greener economy and sustainable development. The chapter briefly describes Austria's progress in reducing the carbon, energy and material intensities of its economy; in managing its natural asset base, including its water and biodiversity resources; and in improving the environmental quality of life.

1. Introduction

This chapter provides a snapshot of some key environmental trends in Austria. It highlights some of the main environmental achievements and the remaining challenges on the path towards green growth and sustainable development, focusing on the period since 2000. The chapter is based on indicators from national and international sources, and broadly follows the OECD framework for monitoring progress towards green growth (OECD, 2011). After providing a brief overview of key trends, it describes Austria's progress in using energy and natural resources efficiently, in managing its natural asset base and in improving the environmental quality of life of its people. The state of the environment and key environmental trends are compared, to the extent possible, with those of other OECD countries and in relation to Austria's national and international commitments. The chapter, therefore, aims to provide a baseline for subsequent chapters which assess how effective Austria's environmental policies have been in affecting these trends and in using environmental objectives to generate economic opportunities.

Austria has a small, open economy and its citizens enjoy a high standard of living. Since 2000 its economic performance has been robust, better than that of some key trade partners, including Germany. The 2008-09 recession reduced a range of environmental pressures that had been increasing in the first part of the 2000s. Since then, the economy has rebounded and is projected to grow steadily, thanks to a strong industrial base and relatively sound public finances (Box 1.1 and Figure 1.1).

Figure 1.1. **Gross domestic product in Austria and the OECD**



Note: The dotted lines represent the OECD countries with the highest and lowest GDP growth rate.
Source: OECD (2012), *OECD Economic Outlook No. 91* (database).

StatLink http://dx.doi.org/10.1787/888932894646

Box 1.1. **The economic and social context**

The economy

- Austria's economy is small but healthy. Average annual growth was 1.6% between 2000 and 2012, in line with the OECD average (Figure 1.1).
- The population enjoys relatively high living standards. Average GDP per capita is USD 36 140, eighth among the OECD countries (Annex I.A).
- Austria, like other export-oriented economies, experienced a severe drop (by 3.6%) in GDP in 2008-09 due to the global economic crisis (OECD, 2012a). The economy started to recover in the second half of 2009 as external demand strengthened, and surpassed its pre-crisis peak in the first quarter of 2011 (Figure 1.1). After moderate growth in 2012-13, the economy is projected to grow by 1.8% in 2014 (OECD, 2012b).
- Austria has a strong industrial base. Industry accounts for 29% of value added, above the OECD average of 24.1%. Services account for 69% of gross value added and agriculture for 2% (Annex I.A).
- The environmental goods and services sector has been growing and accounted for nearly 11% of GDP in 2011 (Statistik Austria, 2013) (Chapter 3).
- Tourism contributes significantly to GDP, accounting for 5.5% in 2011 (Statistik Austria, 2012). As the sector is highly dependent on climatic conditions and good quality natural environment, climate change might affect not only tourist regions but also the economy as a whole (Chapter 5).
- International trade plays a significant role in the economy. Exports accounted for 57% of GDP in 2011 and imports for 54%, above the OECD Europe averages of 43% for exports and 41% for imports (Annex I.A).
- Unemployment is relatively low: 4.3% in 2012, compared to nearly 8% for the OECD as a whole (Annex I.B).
- Inequality in income distribution is lower than the OECD and European averages (Annex I.B). In 2011, the 20% of Austria's population with the highest net monetary income earned 3.8 times more than the 20% with the lowest, while this indicator for the EU was 5.1. The poverty rate is lower than the OECD average (Annex I.B).

Public finance

- Austria's fiscal position compares favourably with other euro-area countries, although its public finances worsened markedly during the economic and financial crisis. Fiscal consolidation measures brought the deficit back to 3.1% of GDP in 2012 (compared to 3.3% in the euro area), from the 2010 peak of 4.5% (Chapter 3). Public debt rose to 83% of GDP in 2012 (compared to 100.6% in the euro area) and is set to increase further (OECD, 2012b).
- Government spending has been generally high. In 2011 it stood at 50.5% of GDP, the eighth highest in the OECD. General government expenditure for environmental protection was 0.5% of GDP in 2010, among the lowest shares in the OECD (Chapter 3).
- The tax-to-GDP ratio is also high: it was 42% in 2011, compared to the OECD average of 33.8%. The fiscal structure is heavily skewed towards taxes on labour income and social contributions (Chapter 3).
- Environmentally related taxes accounted for 2.6% of GDP and 6.1% of total tax revenue in 2011, above the respective averages of 1.6% and 5.8% for OECD (Chapter 3).

Box 1.1. **The economic and social context** *(cont.)*

The population

- Austria's population numbered about 8.4 million in 2011. Population density is relatively high by OECD standards (100 inhabitants per square kilometre, compared to 34 for the OECD as a whole), though Austria is the 10th least densely populated European country in the OECD (Annex I.B).
- About 24% of the population lives in urban areas and 46% in rural areas, roughly the opposite of the pattern in the OECD as a whole.
- Austria's population is ageing: the share aged 65 and over increased from 15% in 2000 to 17% in 2011, higher than the OECD average of 14.7%.
- As in other OECD countries, life expectancy at birth has gradually improved, rising from 78.2 years in 2000 to 80.7 years in 2010, putting Austria in the top 15 OECD countries.
- The population is generally well educated: 82.5% of the working-age population (25 to 64 years old) has at least upper secondary education (Annex I.B). However, the share of tertiary graduates in the same age group was 19% in 2009, two-thirds of the OECD average (30%).
- In the OECD Programme for International Student Assessment, 20% of 15-year-old Austrian students performed at the highest level of proficiency in environmental science, slightly above the OECD average (OECD, 2009).

The carbon intensity of the Austrian economy decreased in the second half of the 2000s and remains low by international standards. This reflects the relatively low energy intensity of the economy and the high share of renewables in energy supply and electricity generation. However, energy consumption has increased in all economic sectors. Transport, mainly by road, is the largest consumer of energy and the second largest source of greenhouse gas (GHG) emissions. This is in part due to urban sprawl and related commuting patterns, as well as to the high volume of international and transit freight traffic. About 30% of transport-related GHG emissions are associated with fuel that is bought in Austria but consumed abroad. While GHG emissions have declined since the mid-2000s, they remain above the 1990 level and Austria's Kyoto target (Section 2.1).

Austria has made progress in improving the material productivity of its economy, although efforts will be needed to reach the national long-term target. Austria generates more economic wealth per unit of material used than the OECD Europe average. An effective waste management policy has contributed to this result through high and growing rates of material recycling and waste recovery. Progress has also been made in reducing municipal waste generation, although further efforts are needed to decouple it from private consumption. Municipal waste generated per capita remains well above the OECD Europe average (Section 2.2).

About 60% of Austria's territory is mountainous and nearly half is forested. Only 38% of the land area is available for settlements, essentially in river valleys and basins. The topography exposes the population to a variety of natural hazards, primarily flooding, which could be exacerbated by climate change (Chapter 5). Extensive flood protection measures, intensive use of hydropower and conversion of wetlands into agricultural land have exerted ecological pressures on rivers and lakes. Restoring the good ecological status/potential of water flows will require massive investment (Section 3).

Grassland and arable land area has shrunk further since 2000 because of continued conversion for housing and infrastructure. The rate of soil sealing has outpaced population growth and the national target, putting pressure on natural areas and ecosystems. About 28% of the land area is under some form of nature protection, among the highest levels in the OECD. However, the conservation status of habitats and species is relatively unfavourable, and the endangerment of several key species relatively high (Section 3). Nearly a fifth of the agricultural area is under organic farming, the highest share in the EU. This, together with uptake of environment-friendly agricultural practices, has helped reduce the intensity of fertiliser use, the level of which is now among the lowest in the OECD. As a result, the nutrient surplus has declined and only a few groundwater bodies are now considered at risk from nitrates (Sections 2.2 and 3.2).

The Austrian population appear to be more satisfied with environmental quality than the European population on average, though the share of unsatisfied people grew in the latter part of the last decade. The burden of disease attributable to the environment is among the lowest in Europe. Austria's water quality is among the world's best in terms of potential health impacts, thanks to the very large share of population connected to high-standard wastewater treatment plants. However, exposure to air pollution from particulates and ozone in urban areas is persistently high. Although emissions of major air pollutants have fallen significantly, emissions of nitrogen oxides (NO_X) exceed the national ceiling. Road transport is the major source of NO_X emissions, largely due to the high and increasing share of diesel in the overall vehicle fleet (Section 4).

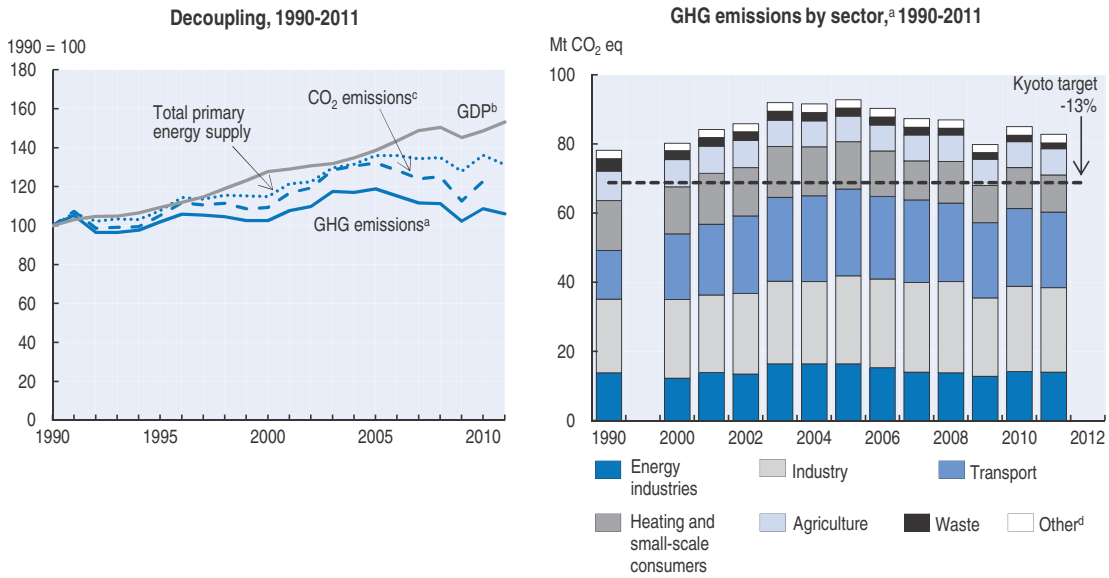
2. Transition to a low-carbon, energy- and resource-efficient economy

2.1. Carbon and energy intensities

Greenhouse gas emissions

- Austria's GHG emission intensity is low by international standards: it stood at 286 grammes per dollar of GDP (at 2005 PPPs) in 2010, compared with the OECD average of 430 grammes (Annex I.C). Its level reflects the relatively low energy intensity of the economic structure and the low-carbon energy mix (see below).
- As of 2011, Austria was far from reaching its Kyoto target of reducing GHG emissions by 13% from the 1990 level by 2008-12. Gross GHG emissions have exceeded the base-year levels since 1995 (Figure 1.2). GHG emissions, excluding land use, land-use change and forestry, were 6% above the 1990 level in 2011. Thus Austria needs to purchase a significant amount of Kyoto credits to meet the target (Chapter 2).
- The increase in emissions mostly occurred in the first half of the 2000s, mainly due to increased transport activity and higher energy demand linked to economic growth. As in many other countries, emissions declined in the second half of the 2000s.
- Austria achieved an absolute decoupling of GHG emissions from economic growth between 2005 and 2008. However, GHG emissions have followed the GDP trend since 2009 (Figure 1.2).
- Many factors contributed to the decline in emissions, including a dramatic increase in oil prices, renewal of the vehicle fleet, support for increased use of renewables and transport biofuels, and promotion of energy efficiency in buildings, as well as the economic slowdown at the end of the decade and a mild winter in 2011 (Umweltbundesamt, 2013) (Chapters 2 and 3).

Figure 1.2. **GHG emissions and Kyoto target**

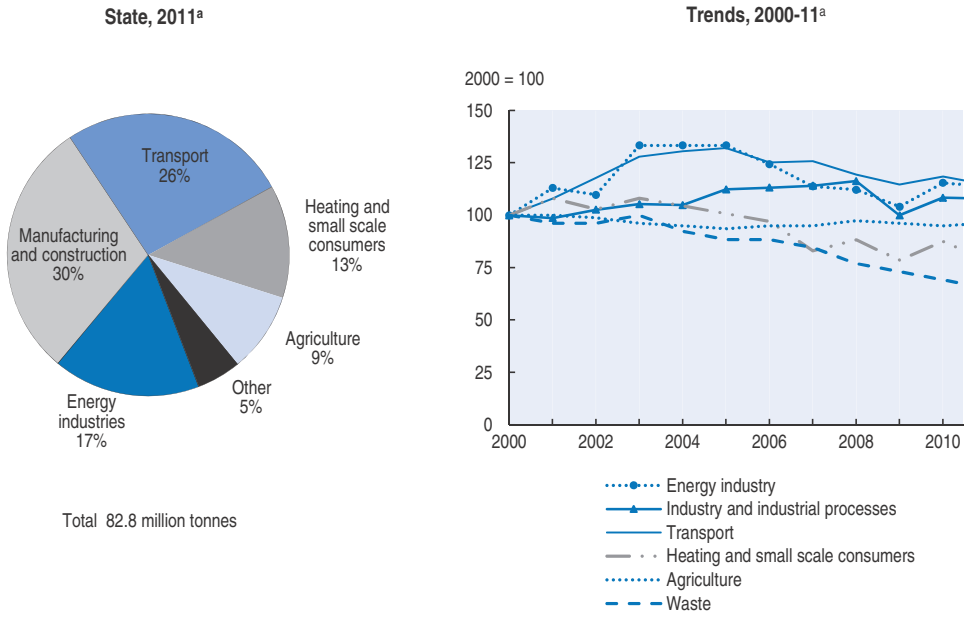


a) Excluding emissions/removals from land use, land-use change and forestry.
b) GDP at 2005 prices and purchasing power parities.
c) CO_2 emissions from energy use only; sectoral approach; excludes international marine and aviation bunkers.
d) F-gases and other gases.
Source: OECD (2012), *OECD Economic Outlook No. 91* (database); OECD-IEA (2012), *CO_2 Emissions from Fuel Combustion* (database); OECD-IEA (2012), *Energy Balances of OECD Countries* (database); Umweltbundesamt (2013), *Austria's Annual GHG Inventory 1990-2011.*

StatLink http://dx.doi.org/10.1787/888932894665

- Manufacturing and transport are the main sources of GHG emissions, the former accounting for 30% of total emissions in 2011 and the latter for 26% (Figures 1.2 and 1.3). Despite a decline in the second half of the 2000s, in 2011 GHG emissions from industry were still 8% above the 2000 level while those from transport were 15% higher (Figure 1.3).
- The transport emissions include those associated with fuels that are bought in Austria but consumed elsewhere. This transport "fuel tourism" by purchasers from neighbouring countries and for commercial vehicles has undergone a sharp increase (Chapter 3). Estimates indicate that about 30% of GHG emissions from transport are due to fuel tourism (Austrian Energy Agency, 2012; Umweltbundesamt, 2012).
- The energy industry is the third largest source of GHG emissions (Figure 1.3): at the end of the decade energy emissions were 14% above the 2000 level. In contrast, emissions from the commercial and residential sectors (heating and small-scale consumers) considerably declined during the decade.
- Looking ahead, projections indicate that Austria will need to implement additional measures to achieve its target of cutting GHG emissions from sectors outside the EU Emission Trading System by 16% by 2020 compared to 2005 levels (Umweltbundesamt, 2011).

Figure 1.3. **GHG emissions by sector**



a) Excluding emissions/removals from land use, land-use change and forestry.
Source: Umweltbundesamt (2013), *Austria's Annual GHG Inventory 1990-2011.*

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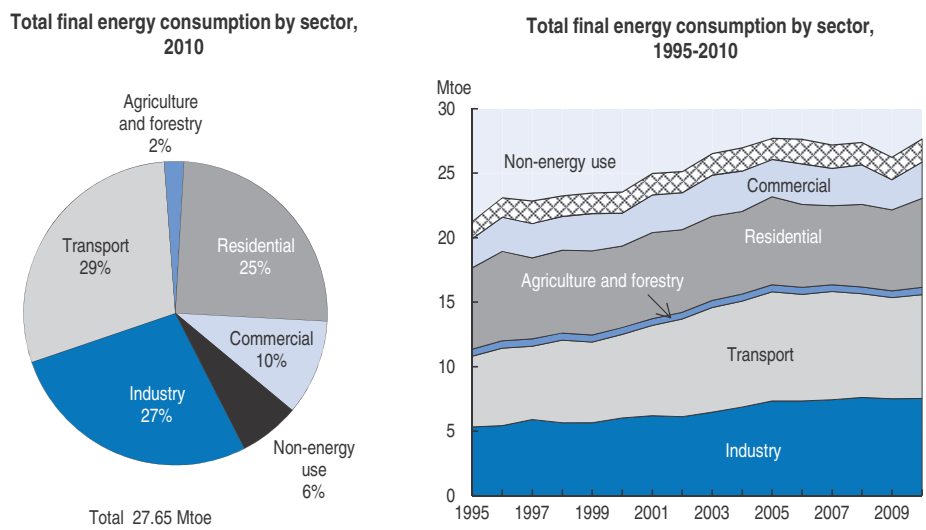
Energy intensity

- Energy consumption has increased in all economic sectors. The increase was more rapid in the first half of the 2000s, when energy demand, especially from industry and transport, grew faster than GDP (Figure 1.4).

Figure 1.4. **Final energy consumption**



Source: OECD-IEA (2012), *Energy Balances of OECD Countries* (database).

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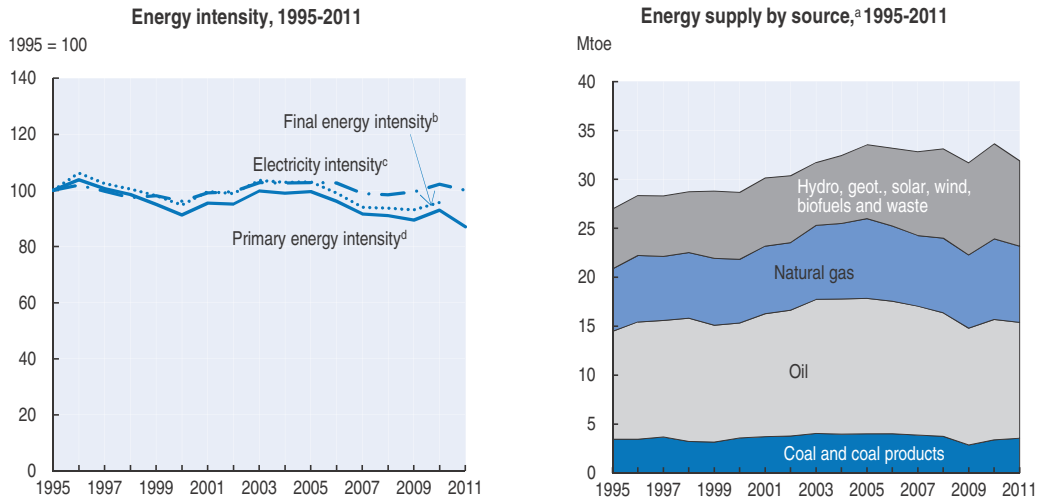
- As a result, Austria's total primary energy supply (TPES) also grew faster than GDP in 2000-05, leading to a rise in the energy intensity of the economy (Figure 1.5). Overall, TPES rose by 11% between 2000 and 2011.

Figure 1.5. **Energy structure and intensity**



a) Total primary energy supply. Breakdown excludes electricity trade.
b) Total final consumption of energy per unit of GDP at 2005 prices and PPP.
c) Electricity consumption per unit of GDP at 2005 prices and PPP.
d) Total primary energy supply per unit of GDP at 2005 prices and PPP.
Source: OECD (2012), *OECD Economic Outlook No. 91* (database); OECD-IEA (2012), *Energy Balances of OECD Countries* (database).

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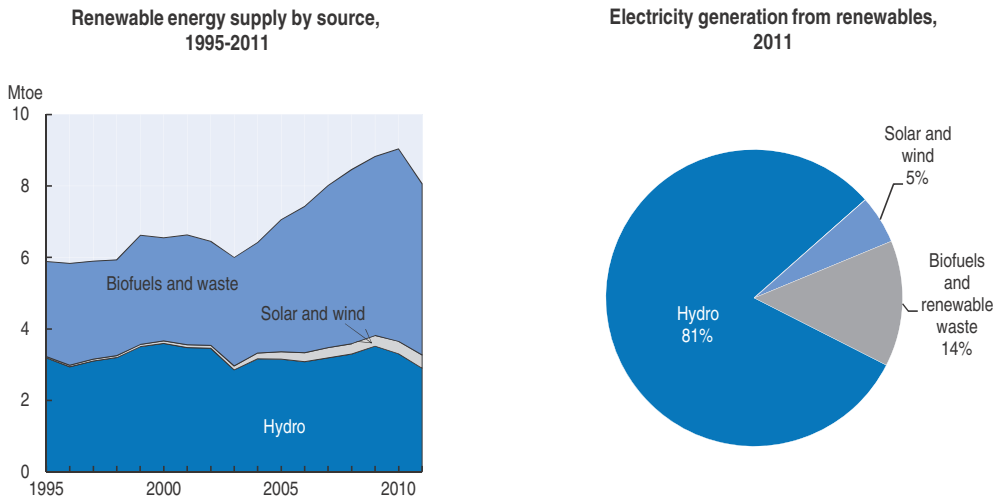
- Energy demand declined in the second half of the decade, especially in the transport and building (commercial-residential) sectors (Figure 1.4), which explains the corresponding decrease in GHG emissions (Figures 1.2 and 1.3). Consequently, Austria's energy intensity has also declined since the mid-2000s (Figure 1.5), and has remained lower than in many other OECD countries (Annex I.A).
- Energy savings achieved by 2010 were about 2.7 times more than the intermediate target Austria had set for itself pursuant to the EU Directive on Energy End-Use Efficiency and Energy Services (2006/32/EC). However, at the current pace, Austria will fall slightly short of the 2016 target of reducing energy consumption by 9% compared to the 2000-05 average (BMWFJ, 2011a).

Energy mix

- Austria has a relatively low-carbon energy mix. Renewable energy sources accounted for 27% of TPES in 2011, more than three times the OECD average. Fossil fuels made up the remainder. Austria does not use nuclear power (Annex I.B). The role of fossil fuels, especially oil and coal, has slightly decreased (Figure 1.5).
- Energy supply from renewables grew by about 23% between 2000 and 2011. Production increased from all sources except hydropower, which is subject to meteorological variations. As a result of the policy focus on biomass (Chapter 3), the use of biofuels and renewable waste substantially increased (Figure 1.6), to nearly 60% of the renewable energy supply in 2011.

- Renewables account for the largest share of electricity generation (68% in 2011). Natural gas amounts to about 20%, and the rest is mainly generated from coal. More than half of electricity generation is hydropower, which accounts for more than 80% of the renewables-based electricity (Figure 1.6).
- Both wind and solar photovoltaic generation capacities have grown significantly since 2000 (overall about a 25-fold increase), but still accounted for a relatively minor share of renewables-based electricity generation in 2011 (Figure 1.6).

Figure 1.6. **Energy from renewable sources**



Source: OECD-IEA (2012), *Energy Balances of OECD Countries* (database).

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- Overall, Austria is on track to achieve its target of 34% as renewables' share of gross final energy consumption by 2020, pursuant to the EU Renewable Energy Directive (2009/28/EC). As Table 1.1 indicates, total renewables were just below the intermediate target in 2010, but the use of renewables for heating and cooling and transport was above the respective targets.

Table 1.1. **Progress towards the 2020 targets for renewable energy sources**

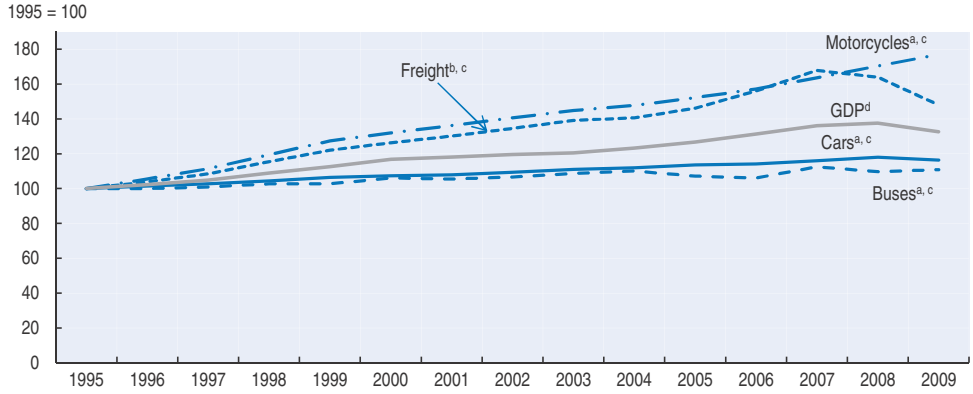
Renewable energy sources for:	Renewables as a share of gross final energy consumption				Estimated GHG savings
	Achieved (%)		Target (%)		Mt CO_2 eq
	2005	2010	2010	2020	2010
Heating and cooling	24.3	32.2	30.5	32.6	11.7
Electricity generation	60.8	65.3	69.3	70.6	18.2
Transport	2.3	7.9	6.8	11.4	–
Total	24.4	30.8	31.1	34.2	29.9

Source: BMWFJ (2010; 2011b).

Transport

- The transport sector remains the largest consumer of energy (29% of final energy consumption) and, consequently, the second largest source of GHG emissions (Figures 1.3 and 1.4). As in other countries, road transport accounts for the vast majority of energy use and GHG emissions from this sector.
- Road transport volumes grew for most of the 2000s, due in part to the EU enlargement. Freight haulage by road and the use of motorcycles grew much faster than GDP (Figure 1.7). The decline of freight traffic since 2007 can be partly attributed to the economic slowdown and hikes in fuel prices (Chapter 3).

Figure 1.7. **Road transport trends**



a) Index of relative change since 1995 based on values expressed in passenger-kilometre.
b) Index of relative change since 1995 based on values expressed in tonne-kilometre.
c) Data refer to national vehicles only.
d) GDP at 2005 prices and purchasing power parities.
Source: OECD (2013), *OECD Environment Statistics* (database); BMLFUW (2013), *Indikatoren für die gesamthafte Bewertung Nachhaltiger Entwicklung in Österreich* (database).

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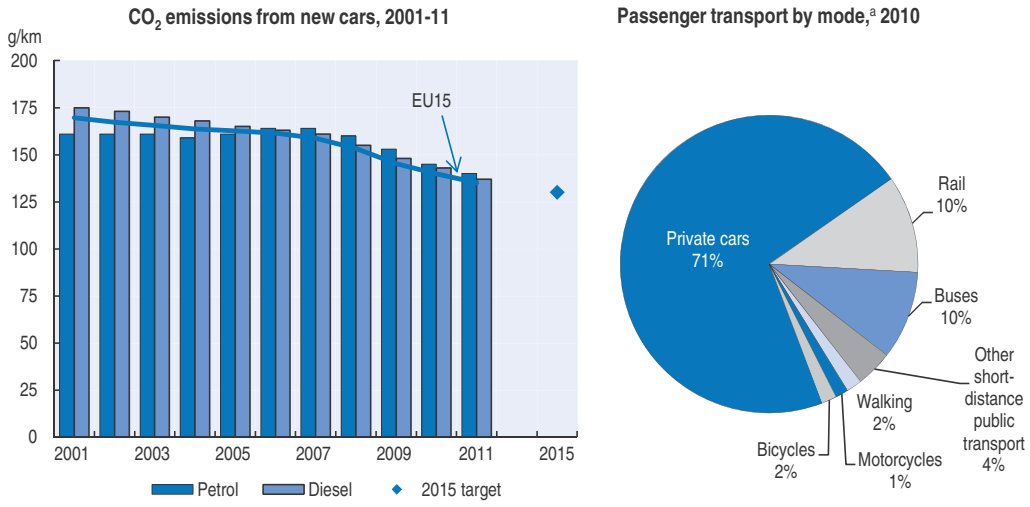
- As in most countries, road dominates the modal split of both freight and passenger transport. In 2010, rail accounted for 32% of domestic freight haulage (BMVIT, 2012), higher than in many OECD countries. The national transport plan aims to reach 40% of freight transport by rail by 2025.
- The passenger transport modal split has changed only slightly in the last decade, in favour of rail transport. Environment-friendly transport modes (urban public transport, rail, cycling and walking) covered 27.5% of passenger traffic in 2010 (Figure 1.8). Private cars accounted for more than 70% of passenger travel, a share that nevertheless is lower than in most OECD countries (Annex I.A).
- With 53 private cars per 100 persons, Austria has one of the OECD's highest car ownership rates (Annex I.A). The carbon efficiency of newly registered cars is good and improving, although it remains slightly above the EU average (Figure 1.8).
- Austria has an extensive and well-developed public transport network. Most of the population has access to public transport, with some regional differences (Table 1.2). However, a growing share of the population is tending to settle in suburbs, further away from public transport connections (BMLFUW, 2011a). This is leading to urban sprawl and increased commuting.

Figure 1.8. **Passenger transport**



a) Based on data expressed in passenger-kilometre.
Source: BMLFUW (2013) *Facts and Figures* (database); EEA (2012), *Monitoring CO_2 emissions from new passenger cars in the EU: summary of data for 2011.*

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Table 1.2. **Access of population to public transport**

Land	Accessibility[a] 500 m		Accessibility[a] 1 500 m	
	%	Change 1995-2005 %	%	Change 1995-2005 %
Burgenland	72	–12	93	–6
Carinthia	76	6	96	–1
Lower Austria	75	–6	94	–3
Upper Austria	73	7	95	2
Salzburg	80	5	96	–1
Styria	67	–1	90	–5
Tyrol	80	7	97	–1
Vorarlberg	90	4	98	–1
Vienna	100	n.a.	100	n.a.
Austria (excluding Vienna)	75	2	90	–2
Austria	80	n.a.	95	n.a.

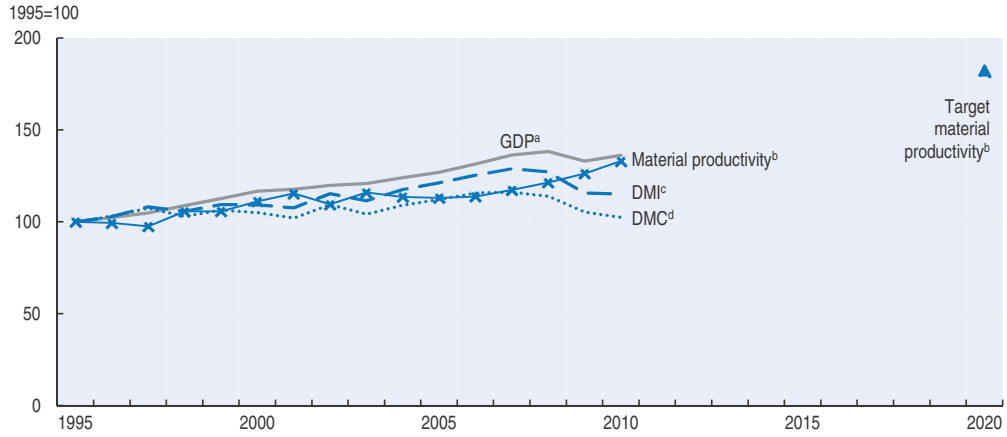
a) Share of the population living within a radius of 500 m or 1 500 m from a public transport stop.
Source: BMLFUW (2011a).

2.2. Resource efficiency

Material productivity

- Austria's economy is heavily dependent on imports of raw materials (particularly fossil fuels and metals), partly for domestic consumption but also, increasingly, for exports.
- Austria generates more economic wealth per unit of material used than the OECD Europe average. Domestic material consumption (DMC)[1] is characterised by a relatively high proportion of biomass (for livestock and forestry production) and a low share of fossil fuels (Annex I.C).
- Between 1995 and 2010, as GDP grew much faster than DMC, material productivity improved by 33%. Recent progress is mainly explained by the post-crisis decline in construction (Figure 1.9).

Figure 1.9. **Material productivity**



a) At constant prices.
b) Material productivity designates the amount of GDP generated per unit of materials used. It refers to the ratio of GDP to domestic material consumption (DMC), where DMC is the sum of domestic (raw material) extraction used by an economy and its physical trade balance. A rise in material productivity is equivalent to a decline in material intensity (i.e. DMC/GDP).
c) Direct Material Input (DMI) designates the direct flows of materials that physically enter the economic system as inputs. It refers to the domestic (used) extraction plus imports.
d) Domestic material consumption (DMC) designates the sum of domestic (raw material) extraction used by an economy and its physical trade balance.
Source: Statistik Austria (2013), *Material Flow Accounts as of 1995* (database).

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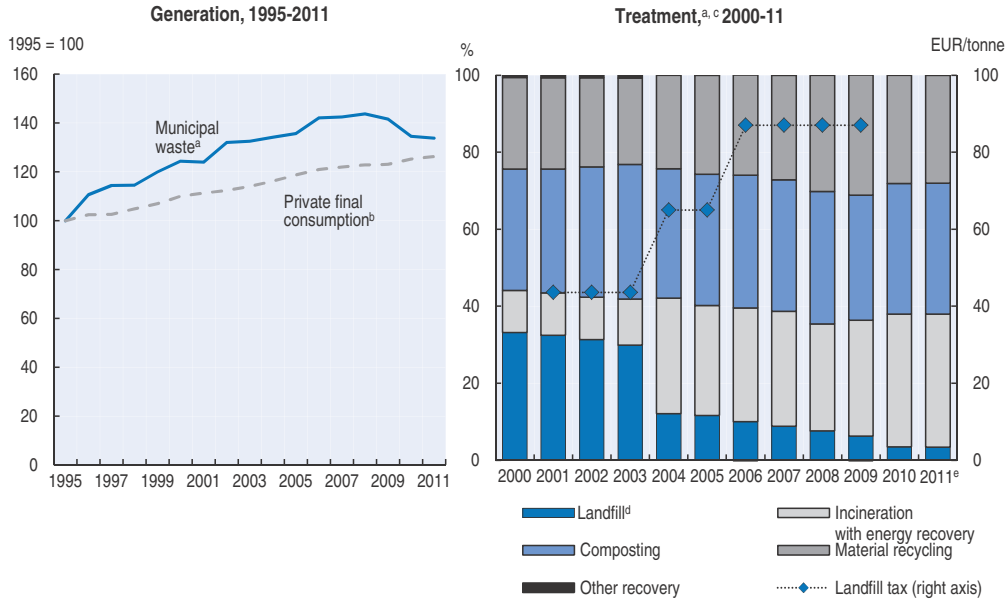
- In a business-as-usual scenario, productivity of resources is expected to grow at an annual rate of 1.2% (Eisenmenger et al., 2011). Efforts will be needed to increase resource productivity by 50% by 2020 (from the 2008 level) and to reach the long-term target of factor 4 established in the 2012 Resource Efficiency Action Plan.

Waste generation and recovery

- Total waste generation (excluding excavated material) increased by 8% between 1999 and 2008, then declined with the economic downturn (BMLFUW, 2011b). Increasing construction by the Austrian Federal Railways drove significant growth (+27% until 2008) in generation of excavated material waste.
- While recent progress has been recorded in reducing municipal waste, particularly garden and park waste, further efforts are needed to decouple municipal waste generation from private consumption (BiPRO, 2012; Figure 1.10).
- With 550 kg of municipal waste generated per capita, Austria remains well above the OECD Europe average of 500 kg of per capita (Annex I.C).
- There has been a shift from disposal in landfills to thermal treatment due to a ban on landfilling of untreated municipal waste in force since 2004, and a gradual increase in the landfill tax (Figure 1.10 and Chapter 3) (EEA, 2013).
- In 2011, Austria had the highest municipal waste composting rate in the European Union at 34%, compared with the EU average of 15%, and the second highest rate of material recovery (62%, against an EU average of 40%).
- Austria has exceeded the EU targets on recycling for various types of waste, including packaging, end-of-life vehicles and waste electrical and electronic equipment.

Figure 1.10. **Municipal waste**



a) Waste collected by or for municipalities. Includes household, bulky and commercial waste, and similar waste handled at the same facilities. Excludes construction site waste and on-site composting of green waste from municipal service.
b) At constant 2005 prices.
c) Up to 2003, total treatment includes some double counting.
d) 2000 data include residues from other operations (about 30%).
e) Estimates.
Source: OECD (2013), *OECD Environment Statistics* (database).

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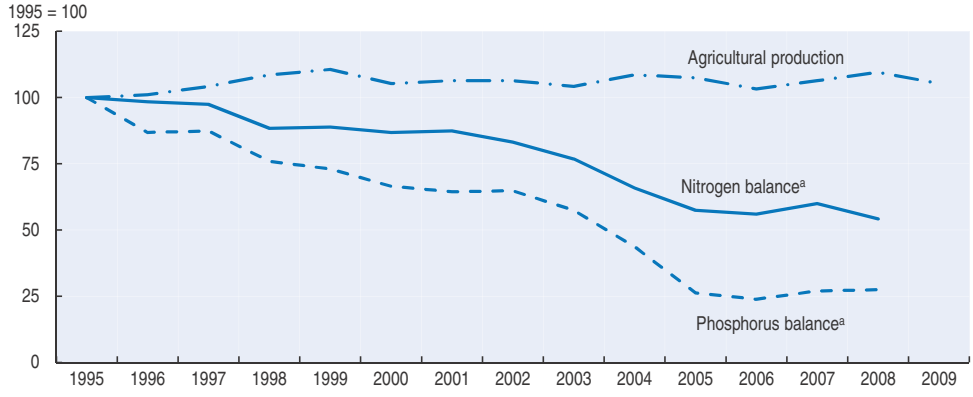
Nutrient balance and agricultural inputs

- While agricultural production remained stable in the 2000s, nitrogen and phosphorus balances steadily decreased (Figure 1.11), with positive impacts on water quality (Section 3). The surplus of nitrogen declined by 5.4% a year and that of phosphorus by 10.3% a year between 1998-2000 and 2007-09, much faster than the respective 1.4% and 5.4% declines in the OECD as a whole (OECD, 2013).

Figure 1.11. **Nutrient balances**



a) Gross nutrient balance; three-year moving average data.
Source: OECD (2013), *Agri-Environmental Indicators* (database).

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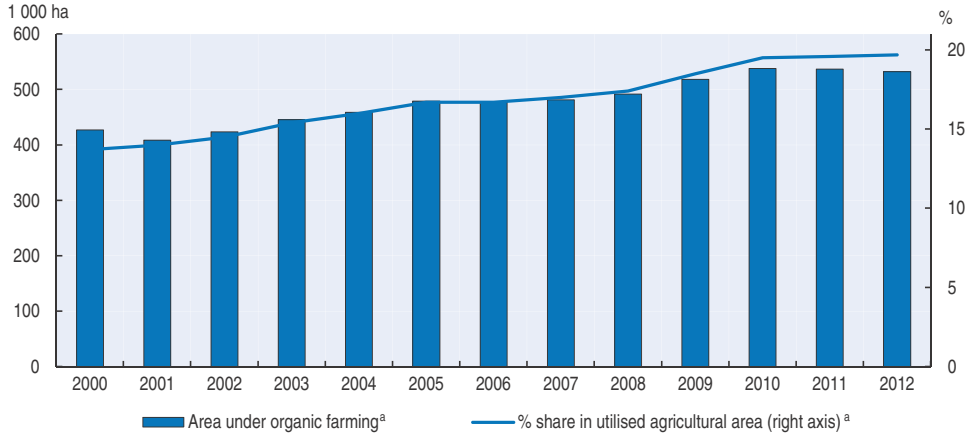
- Declines in numbers of cattle and in fertiliser use contributed to this achievement. Austria is among the ten OECD countries with the lowest levels of nitrogenous fertiliser use per square kilometre of agricultural land (Annex I.C). This is due partly to the uptake of environment-friendly agricultural practices and the growth of organic farming, supported by federal agri-environmental programmes (Chapter 2).
- The agricultural area under organic farming[2] increased by 26% between 2000 and 2011 to reach 19% of the utilised agricultural area (Figure 1.12). This is the highest share in the EU but falls slightly short of the national target of 20% by 2010 set by the Organic Farming Action Programme 2008-10.

Figure 1.12. **Organic farming**



a) Agricultural area under subsidiesed organic farming in the integrated administration and control system (IACS).
Source: BMLFUW (2013), *Facts and Figures* (database).

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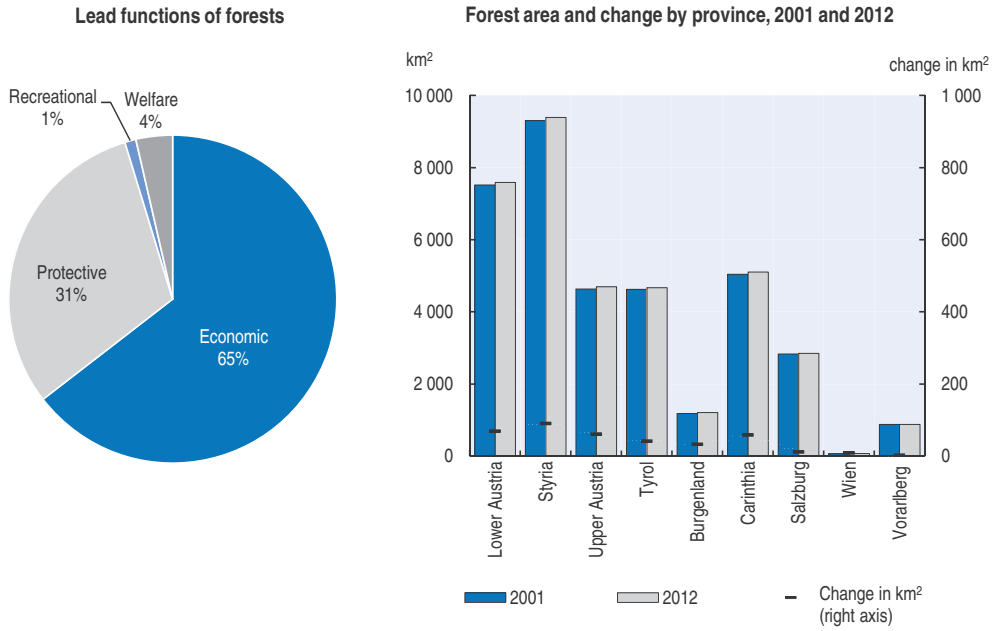
- However, the quantity of pesticides sold per square kilometre of farmland has tended to grow since 2000, despite the stability of agricultural production (Chapter 4). Pesticide intensity in Austria remains, nonetheless, below the OECD Europe average (Annex I.C).

3. Managing the natural asset base

3.1. Biodiversity and ecosystems

- About 60% of Austria's territory is mountainous, with only 32% of the territory lying below 500 metres above mean sea level. Therefore, the space available for settlements is limited to about 38% of the land area, essentially in river valleys and basins. This exposes the population to a variety of natural hazards, primarily flooding, which could be exacerbated by climate change (Chapter 5).
- Forests are a core feature of the Austrian landscape: nearly half the country's land area is classified as forest land (47%), 21% as grassland and about 17% as arable land. Austria has one of the largest growing stocks of forest and other wooded land in the OECD (Annex I.C).[3]
- Forests serve a variety of functions in Austria, including protecting soil, water and ecosystems. More than 40% of the forested area is classified as moderately altered, while a quarter of it is made up of natural or semi-natural forests (BMLFUW, 2010a). The

Figure 1.13. **Forests**



Source: BMLFUW (2013), *Facts and Figures* (database); BMLFUW (2013), *Indikatoren für die gesamthafte Bewertung Nachhaltiger Entwicklung in Österreich* (database).

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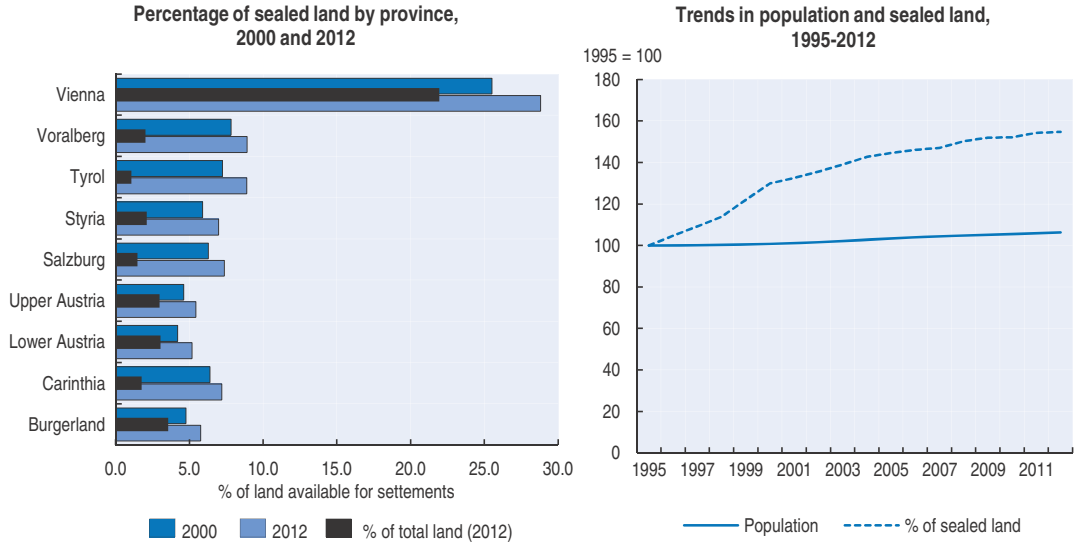
forested area has increased by about 1% since 2001, in line with the long-term trend, and in all regions (Figure 1.13).

- Grassland and arable land area decreased by more than 1 000 km^2 between 2001 and 2012, or by 30 ha per day. Almost one-third of the lost agricultural area has been converted into forest and the rest into housing and infrastructure development (BMLFUW, 2011a).
- A little more than 50 000 ha of agricultural land was used for energy crops in 2010. There is no evidence that the increased use of biomass and biofuels has generated land-use changes in Austria, nor that it has affected biodiversity or water (BMWFJ, 2011b).
- Conversion of undeveloped land for housing, transport and other infrastructure (soil sealing) has continued to increase since 2000. In 2012, sealed land accounted for 2.3% of the total land area and about 6% of the area available for settlements, with considerable regional variation (Figure 1.14).
- While the rate of soil sealing has slowed during the last decade, it has far outpaced population growth. It remains nearly eight times higher than the target value of 1 ha of sealed land per day set by the Austrian Strategy for Sustainable Development (BMLFUW, 2011a).
- About 28% of the land area is under some form of nature protection. This share has remained virtually stable since 2000 and is among the highest in the OECD (Annex I.C). Natura 2000 sites account for nearly 15% of the land area and cover nearly 90% of the habitats and species that are listed in the EU Habitats Directive and are present in Austria.

Figure 1.14. **Soil sealing**



a) Sealed land is the sum of built-up areas ("buildings" and "paved" areas, factored in at rate of 100% and areas of unspecified use, factored in at a rate of 30%) and other areas ("roadways", factored in at 60% and "other areas", factored in at 10%).
Source: BMLFUW (2013), *Indikatoren für die gesamthafte Bewertung Nachhaltiger Entwicklung in Österreich (database);* OECD (2013) *OECD Environment Statistics* (database).

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- Protected areas include a variety of legal designations, often different at *Land* level (Table 1.3). About 18% of the land area is protected under "low" IUCN management categories (V and VI), while some 7% is under "high quality nature protection" (IUCN categories I to IV) (EEA, 2012a).

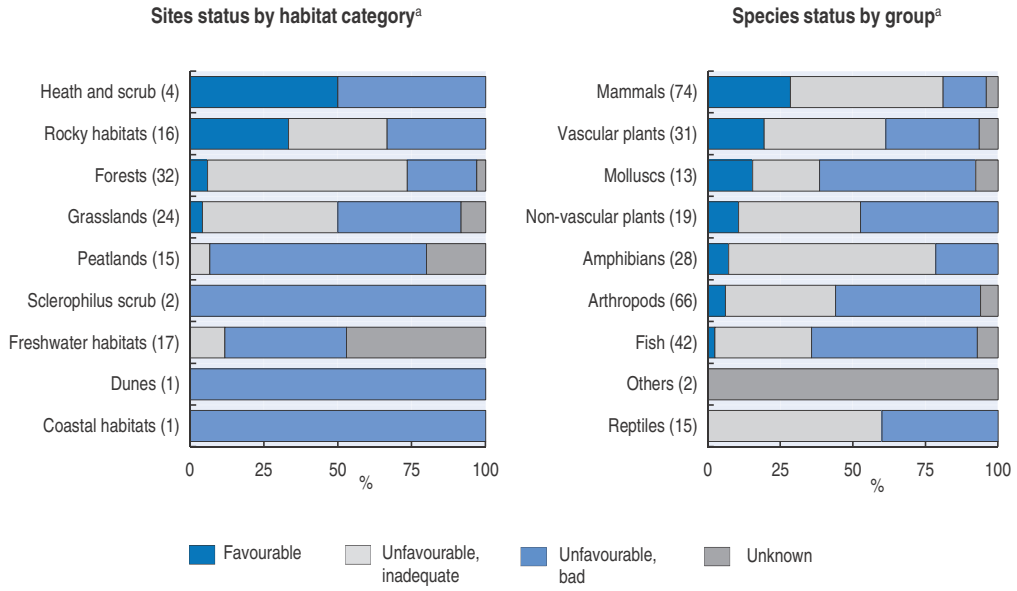
Table 1.3. **Area protected under nature conservation legislation in 2011**

	Number	Area in ha	% of the federal territory
Landscape conservation areas	249	1 254 633	15.0
Natura 2000 sites, *of which:*	220	1 232 400	14.7
Sites protected under a national designation	181	1 081 043	12.9
Natural parks	48	402 042	4.8
Nature conservation areas	453	300 432	3.6
National parks	6	235 257	2.8
Other protected areas (except natural monuments)	36	148 331	1.8
Nature-landscape conservation areas	4	50 633	0.6
Protected landscape elements	342	8 422	0.1

Source: BMLFUW (2012); EC (2011).

- However, the conservation status of habitats and species is relatively unfavourable (Figure 1.15). Overall, only about 18% of habitat types and 11% of species of European Community importance that are found in Austria have favourable conservation status (BMLFUW, 2010a).
- The population of some bird species living in agricultural areas and forests has slightly declined, as is the case in Europe more generally (Figure 1.16). This decrease may indicate declining quality of habitats (BMLFUW, 2011a).

Figure 1.15. **Conservation status of sites and species of European Community importance in the 2000s**



a) Data in brackets indicate the number of occurences for each category/group.
Source: European Topic Centre on Biological Diversity (2008), Report on Article 17 of the Habitats Directive (92/43/EEC), 2000-06.

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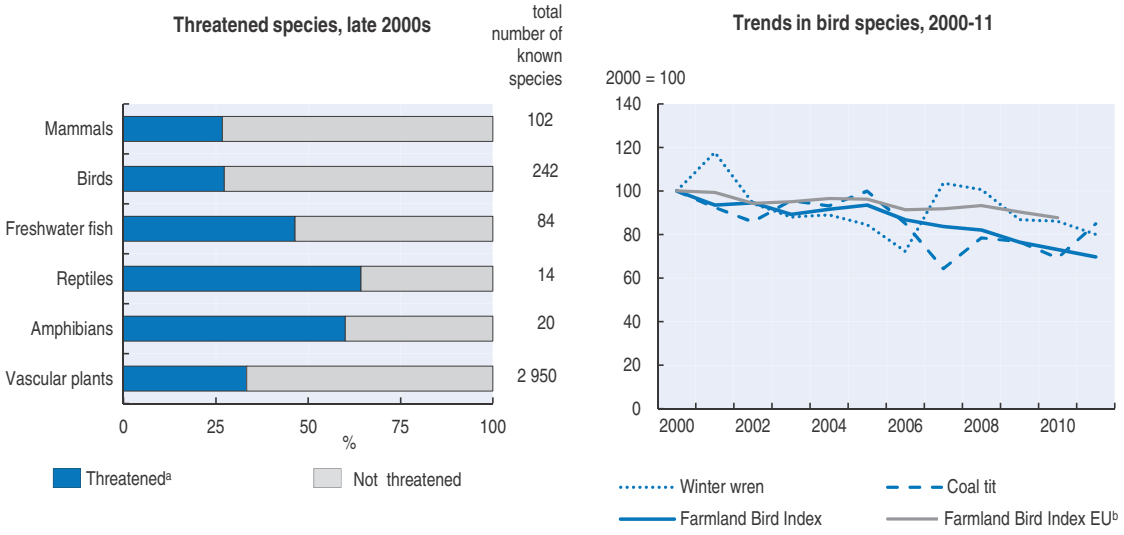
- Levels of endangered mammals, birds, freshwater fish and vascular plants are relatively high compared to other OECD countries (Figure 1.16; Annex I.C). Nevertheless, the population status of some species has considerably improved owing to conservation programmes (BMLFUW, 2010a).[4]

Figure 1.16. **Species of flora and fauna**



a) IUCN categories "critically endangered", "endangered" and "vulnerable" in % of known species.
b) The composite EU index covers 37 common species of birds that depend on farmland.
Source: OECD (2013) *OECD Environment Statistics* (database); BMLFUW (2013), *Indikatoren für die gesamthafte Bewertung Nachhaltiger Entwicklung in Österreich* (database); Eurostat (2013), *Environment and Energy Statistics* (database).

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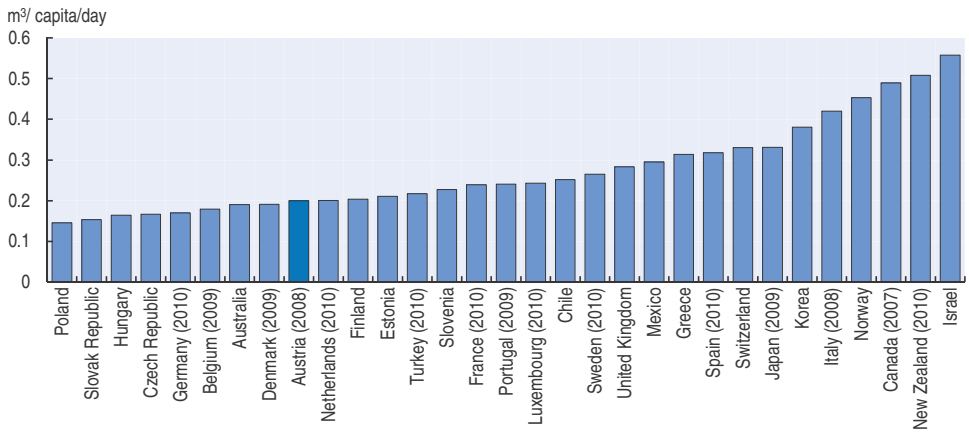
3.2. Water resources

- Water is an abundant resource in Austria and only a small proportion of it is used: annual abstractions amount to around 4% of total available water resources (Annex I.C).
- Freshwater abstraction for public water supply has remained virtually constant since the late 1990s at among the lowest levels in the OECD (Figure 1.17). Nearly all drinking water consumed in the country is groundwater or spring water (Umweltbundesamt, 2010).

Figure 1.17. **Abstraction for public water supply in selected OECD countries in 2011**



Source: OECD (2013), *OECD Environment Statistics* (database).

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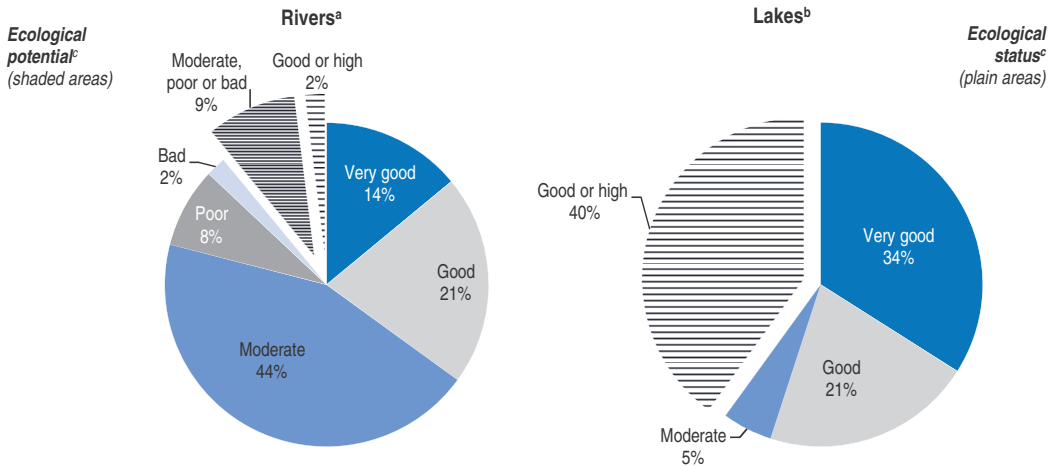
- Industry accounts for the largest share of water demand (61.5%), followed by drinking water supply (30.8%) and agriculture (7.7%) (Umweltbundesamt, 2010).
- Extensive flood protection measures and intensive use of hydropower (Section 2.1) have altered river morphology and hydrological conditions.
- As a result, 11% of surface water bodies are heavily modified and artificial. More than 80% of the heavily modified and artificial rivers fail to meet "the good ecological potential" required by the EU Water Framework Directive (WFD) (Figure 1.18).
- In addition, more than 60% of natural rivers and 8% of natural lakes fail to meet "the good ecological status" required by the WFD (Figure 1.18). While Austria will make use of an extension until 2027 to comply with the WFD, achieving the first intermediate targets for ecological status and potential will remain challenging.[5]
- Pollution of surface waters is very low. Only 2% of surface water bodies exceed national pollution standards, and only 0.3% fail to meet the good chemical status required by the WFD (BMLFUW, 2011a). However, rivers show elevated concentrations of several chemicals present in pesticides for which no standards have yet been adopted (Box 4.8).
- In 2011, more than 98% of monitored inland bathing waters complied with mandatory values of the EU Bathing Water Directive, compared to 92% in the EU as a whole. The proportion of bathing waters of excellent quality has increased to 83.5%, against the EU average of 77% (EEA, 2012b).[6]

Figure 1.18. **Ecological status and potential of water bodies in 2009**



a) Running waters with catchment area > 10 km^2 (totally 31 466 km).
b) 62 lakes with area > 50 ha.
c) Ecological status of natural water bodies; ecological potential of heavily modified and artificial water bodies.
Source: BMLFUW (2013), *Facts and Figures* (database).

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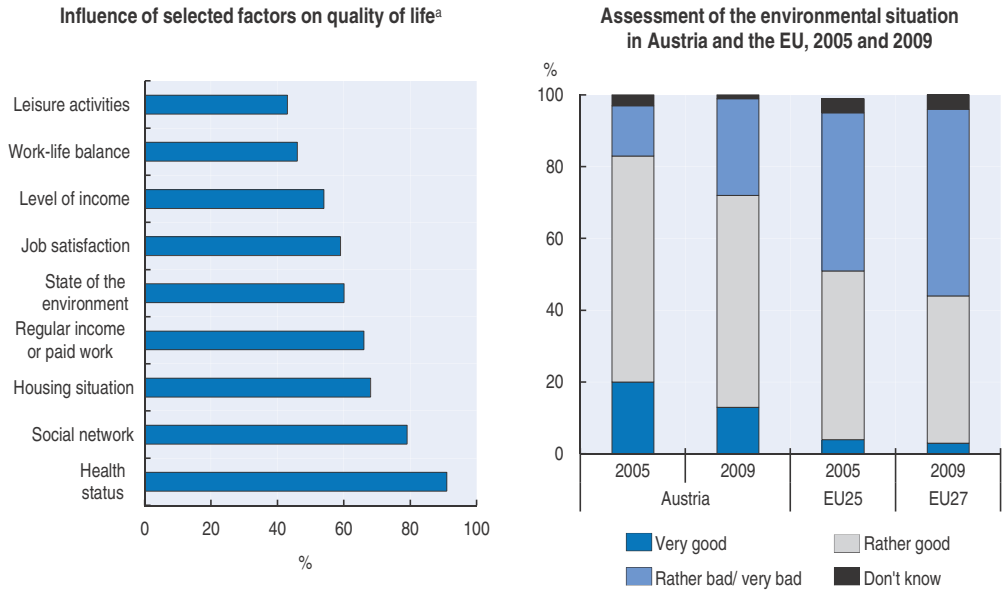
- Groundwater quality is generally good. Only 3 out of 136 groundwater bodies do not maintain a good chemical status as required by the WFD. They are concentrated in farming areas in eastern Austria, where groundwater renewal is slower due to lower precipitation (Umweltbundesamt, 2010).
- Nitrates are the main cause of poor water quality. However, nitrate pollution and the nitrogen balance have decreased since 2000 (Figure 1.11). As of 2009, less than 12% of groundwater monitoring sites were considered at risk from nitrates (concentrations above 45 mg/litre) (BMLFUW, 2011a).
- Levels of other pollutants in groundwater, including pesticides, have also decreased. Threshold values continue to be exceeded at some monitoring sites, although this does not impair the good chemical status of groundwater bodies. Following a ban on the use of the herbicide atrazine, the proportion of monitored groundwater sites exceeding the limit value fell steadily, reaching 1.8% in 2009 (BMLFUW, 2011a).
- In sum, water quality has generally improved owing to more advanced wastewater technology, increased rates of connection to wastewater treatment plants (Section 4), action programmes to reduce nitrates and more widespread use of environment-friendly agricultural practices, all supported by government investment aid (Chapters 2 and 3).

4. Improving the environmental quality of life

4.1. *Environment and well-being*

- In a 2009 survey, 60% of respondents indicated that they considered the state of the environment very important for their quality of life (Figure 1.19), with environment coming fifth, immediately after a regular income (BMLFUW, 2010b).
- Overall, Austrians appear to be more satisfied with their country's environmental quality than Europeans on average: in 2009, 72% of the Austrian population rated the quality of

Figure 1.19. **Environmental quality of life**



a) Percentage of respondents who reply "strong" to the question "How do you evaluate the influence of these factors on your quality of life (strong, moderate or little)?"
Source: BMLFUW (2010), *Well-being of the Austrian People.*

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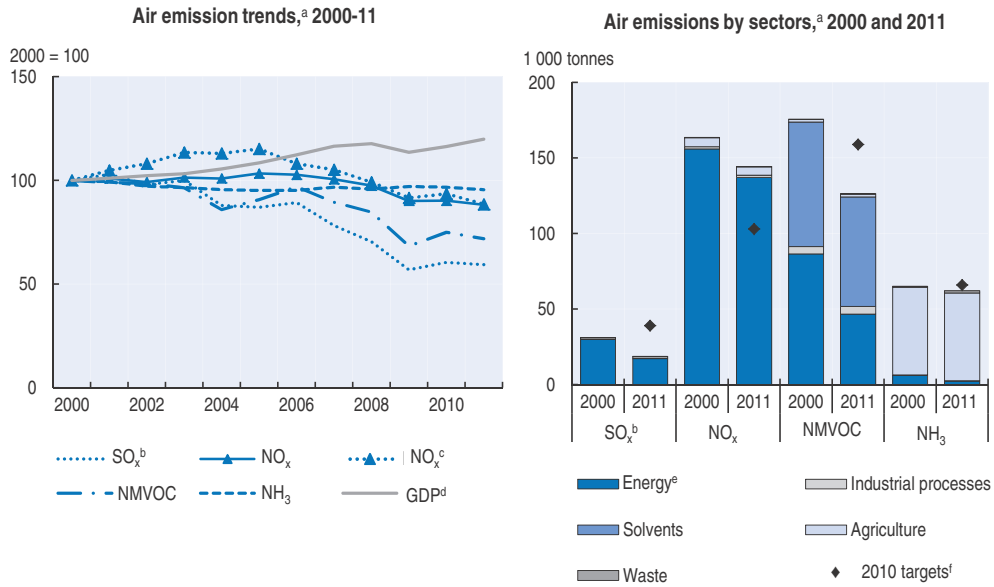
the environment in their country as rather good or very good, compared to an EU average of 44% (Figure 1.19).

- However, the share of unsatisfied people grew more in Austria than in Europe as a whole between 2005 and 2009 (Figure 1.19). This trend can be linked to increasing public environmental debates and awareness, and may indicate that people have become more demanding (BMLFUW, 2010b).
- The level of public satisfaction is above 90% for quality of rivers and lakes, quality of drinking water and availability and conditions of green spaces. It falls to about 80% for air quality and to about 65% for exposure to noise (BMLFUW, 2010b).
- The proportion of Austria's people who report being disturbed by noise during the day, at night or both grew from 29% in 2003 to 39% in 2007. The most frequently reported source of noise is road traffic (BMLFUW, 2011a).

4.2. Air emissions and air quality

- Emissions of sulphur and nitrogen oxides (SO_X and NO_X) have continued to decrease since 2000 (Figure 1.20), although at a slower pace than in many other OECD countries. Emissions of SO_X and NO_X per unit of GDP remain lower in Austria than the OECD Europe average (Annex I.C).
- Between 2000 and 2011, emissions of SO_X declined by 41%, non-methane volatile organic compounds (NMVOCs) by 28% and ammonia by 4.5%. All showed a decoupling from economic performance, especially in the second half of the decade. This allowed Austria to meet the 2010 targets under the EU National Emission Ceilings (NEC) Directive (Figure 1.20).

Figure 1.20. **Air emissions**



a) Exludes emissions related to exported fuel.
b) As SO_2.
c) Includes emissions related to fuel exported.
d) At 2005 prices and purchasing power parities.
e) Includes emissions from power stations, transport and other mobile sources, industrial and other combustion.
f) Targets set by EU Directive 2001/81/EC (NEC Directive) on national emission ceilings for certain atmospheric pollutants.
Source: OECD (2013) *OECD Environment Statistics* (database); OECD (2012), *OECD Economic Outlook No. 91* (database); Umweltbundesamt (2012), *Austria´s Annual Air Emission Inventory 1990-2011.*

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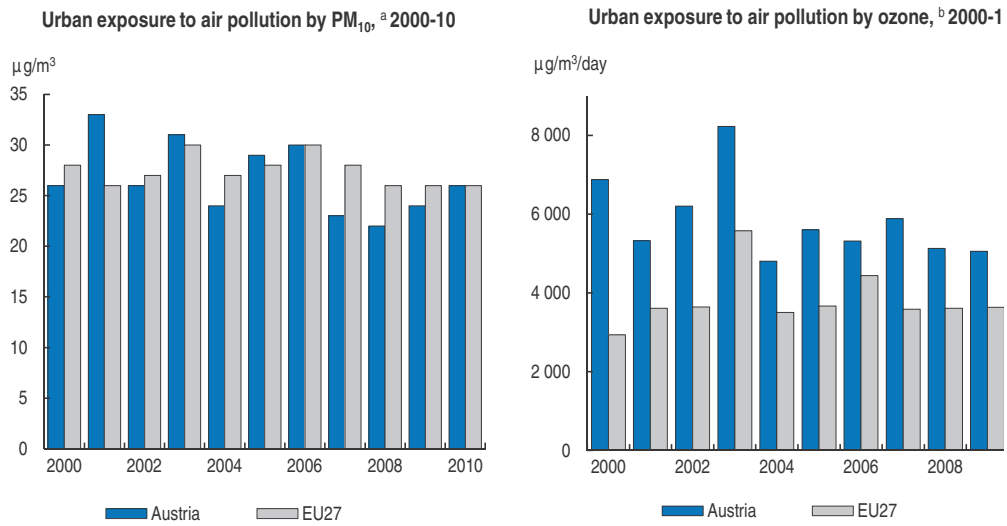
- Contributing factors include use of flue-gas abatement techniques in industry and power plants, widespread use of catalytic converters on vehicles and stricter vehicle emission standards, further fuel switching from solid fuels to gas and renewables (Section 1.1), better fuel quality (lower sulphur content) and decreasing livestock numbers and fertiliser use (Section 1.2), as well as rising fuel prices and the economic slowdown late in the decade (Chapter 3).
- However, although NO_X emissions decreased by about 11%, by 2011 they were still 40% above the target set by the NEC Directive. Transport and other mobile sources, including transit traffic and fuel tourism, are the major source of NO_X emissions (Figure 1.20). The increased share of diesel cars in the fleet (from 37% in 2000 to 55% in 2010) also contributes.[7]
- Total emissions of small particulates continued to decrease between 2000 and 2010: emissions of $PM_{2.5}$ declined by 12% and PM_{10} by 9%. Major sources of particulates are residential heating using solid fuels, road transport, industrial processes and agriculture (Umweltbundesamt, 2010).
- However, the PM_{10} daily limit value (50 µg/m^3) has continued to be exceeded in all regions of the country, especially in large urban areas and in the south-east. The latter experiences unfavourable air dispersion conditions in valleys and suffers from transboundary pollution (Umweltbundesamt, 2010).
- Exposure of the urban population to particulates hovered around the EU average during the 2000s, and has been increasing since 2008 (Figure 1.21). Overall, exposure to urban air pollution from particulates and ozone was among the highest in the EU in 2010.

Figure 1.21. **Pollution from particulates and ozone**



a) Population-weighted annual mean concentrations of particulate matter at urban background stations in agglomerations.
b) Population-weighted annual sum of maximum daily 8-hour average ozone concentrations greater than 70 µg/m^3 at urban background station in agglomerations.
Source: Eurostat (2013), *Environment and Energy Statistics* (database).

StatLink http://dx.doi.org/10.1787/888932895026

- Exposure to ozone has decreased since its peak in 2003, although it has remained constantly above the EU average (Figure 1.21). Persistently high NO_X emissions, including from abroad, cause exceedances of the daily limit value for the protection of human health (120 µg/m^3) in several areas.
- Cadmium, mercury and lead emissions have decreased significantly since 1990. However, cadmium and mercury emissions are once again on the rise, primarily because of increased use of biomass in power plants and industry, and higher steel and iron production (Figure 4.4 and Chapter 4).
- Emissions of persistent organic pollutants, including dioxins and polycyclic aromatic hydrocarbons (PAHs), have fallen dramatically owing to technological improvement in industry and in waste incinerators. Small private firing plants and furnaces are now the main sources of PAH and dioxin emissions (Chapter 4).

4.3. *Water supply and sanitation*

- Some 5 500 water supply companies provide about 90% of Austria's population with drinking water that complies with strict legal requirements. The remaining 10% obtain their drinking water from wells and springs, which have to be regularly checked.
- The share of the population connected to public wastewater treatment plants increased from 88% in 2001 to 94% in 2010, one of the highest shares in Europe. All wastewater treatment plants provide secondary and/or tertiary treatment and meet EU requirements (Annex I.C).

4.4. *Health impacts*

- The latest assessment by the World Health Organization (WHO) indicates that 13% of the burden of disease in Austria is attributable to the environment, down from 14% in the previous assessment (WHO, 2007 and 2009).[8] This is among the lowest levels in Europe.

- The share of the burden of disease associated with poor water sanitation and hygiene is among the lowest in the world. WHO estimates indicate that 1 200 deaths per year in Austria can be attributed to outdoor air pollution (WHO, 2009).
- Modelling studies indicate that, in some *Länder*, $PM_{2.5}$ pollution reduces life expectancy by more than on average in the EU as a whole (EEA, 2012c; Umweltbundesamt, 2010).[9]
- Results of human biomonitoring surveys have shown a body burden of dangerous chemicals such as phthalates in the Austrian population at large and of heavy metals in pregnant women, babies and schoolchildren (Chapter 4).

Notes

1. DMC is the sum of domestic raw material extraction used by the economy and its physical trade balance (imports minus exports of raw materials and manufactured products).
2. Organic farming methods use lower levels of chemically synthesised nutrients and pesticides, thereby reducing the impact of agriculture on biodiversity, soil and water resources. In the EU, organic farming needs to meet the requirements of Council Regulation (EC) No. 834/2007.
3. The growing stock is the living component of the tree standing volume in an area of forest or wooded land.
4. These include eagle owl, European otter, peregrine falcon, black stork, great bustard and European roller (BMLFUW, 2010a).
5. Austria committed to achieving good ecological potential in 23% of all artificial and heavily modified water bodies by 2015, 57% by 2021 and 100% by 2027. The targets for ecological status of natural water bodies are 42% of all natural rivers by 2015, 50% of natural rivers and all lakes by 2021 and all natural rivers by 2027.
6. Bathing waters in compliance with the more stringent guide values.
7. Diesel engines generate higher emissions of NO_X and particulates.
8. The burden of disease is measured by WHO in number of years lost due to ill health, disability or early death (disability-adjusted life years or DALYs).
9. $PM_{2.5}$ pollution reduces life expectancy by an average of 8.6 months in the EU as a whole (EEA, 2012c).

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PART I

Chapter 2

Policy-making environment

Since 2000, Austria has consolidated and further developed what was already a sound environmental policy framework. This chapter reviews the main strategies and initiatives that were launched during the decade in the areas of sustainable development and environmental management. It examines Austria's environmental governance, the regulatory framework for environmental protection, and the activities to ensure compliance with environmental requirements. The chapter also reviews the mechanisms in place to improve horizontal and vertical co-ordination, and the instruments used to systematically evaluate the environmental impacts of economic and sectoral policies. Progress in promoting environmental democracy, through open access to information and improved public participation in decision making, is also discussed.

Assessment and recommendations

Many Austrians are members of environmental non-governmental organisations (NGOs) or alpine associations, indicating a strong interest in environmental policy. In keeping with this, Austria has often been at the forefront of environmental developments in the European Union and internationally, though more so in the past than in recent years.

During the 2000s, the demand for environmental quality, and for better integration of environmental, social and economic policies, was also reflected in the adoption of two strategies for sustainable development. The first, in 2002, established the principle of sustainability in federal policies and actions; the second, adopted at *Land* level in 2010 and reaffirmed at federal level in 2011, provided a common framework for actions at both the federal and *Land* levels. Austria was the first federal country in Europe to adopt such an approach. These initiatives have been accompanied by Local Agenda 21 processes that, by 2012, had been implemented in 19% of municipalities and about half of districts. While steps have been taken to co-ordinate implementation of the two sustainable development strategies, their coexistence has created uncertainty and hindered effective mainstreaming of sustainable development. Further efforts are needed to update the 2002 federal strategy, to make the various sustainable development initiatives more coherent and comprehensive, and to engage federal ministries and *Land* departments more actively.

The national environmental policy framework has been increasingly driven by EU directives. Austria compares well with other countries in implementing EU environmental legislation: between 2007 and 2012, Austrian environmental infringements were below the EU average. However, the *Länder* are exclusively responsible for some environmental issues, and are often unable or unwilling to commit the resources required to discharge their responsibilities. As a result, environmental legislation is relatively fragmented, and there are gaps and inconsistencies in implementation.

The air management policy framework is well established and fully consistent with EU policy. Austria has been at the forefront of waste management policy, and was given a top ranking by the European Commission for compliance with the core elements of EU policy in this area. Although Austria adopted a National Biodiversity Strategy in 2005, more efforts are needed to achieve targets for biodiversity loss and land degradation. This problem is related to the fragmented approaches adopted by the *Länder*, which are responsible for this policy area, and also to the absence of a coherent national spatial development strategy that strikes an appropriate balance between the growth of built-up areas and the conservation of natural spaces and biodiversity.

Austria is one of the few countries that have an integrated approach to environmental impact assessment (EIA) and permitting. However, the approach does not apply to federal road and high-speed railway projects, which has affected the duration and costs of procedures, created legal uncertainty and compromised social acceptance of large transport infrastructure development. Independent evaluations have concluded that while the EIA system generally meets legal requirements, there is room for improvement.

Austria's progress in granting permits to large installations under the EU Directive on Integrated Pollution Prevention and Control (IPPC) is better than the EU average. However, in many cases the IPPC permitting process has resulted in increased administrative burdens and costs for the operators and authorities, especially at *Land* level. Implementation of the Industrial Emission Directive, which superseded the IPPC Directive, provides an opportunity to address some of these issues.

The decentralisation of responsibility for enforcement of environmental policies has resulted in fragmentation. An electronic data management portal was set up to provide support for enforcement activities across the country. There is an initiative under way, involving the federal and *Land* authorities, to develop a national environmental inspection system. This could provide the basis for establishing a more level environmental playing field, based on a consistent, risk-based approach. A more consistent approach should also be applied regarding sanctions linked to financial benefits arising from non-compliance.

A variety of mechanisms are in place to asses, *ex ante*, environmental and other policies, including strategic environmental assessment and regulatory impact assessment. These tools appear to have been applied in line with requirements. However, they have had only a limited impact on policy making. The procedures for applying them should be reviewed so that the results can provide a useful and timely input to decision making. Their impact could also be enhanced if appropriate tools and guidance materials were prepared, and training provided for practitioners.

Austria has a well-developed system of environmental and sustainable development indicators, and has undertaken a series of initiatives to measure well-being. However, there is little evidence that monitoring reports and indicators are systematically used to inform decision making. Austria has adopted a relatively open approach on information to the public and generally responds positively to requests for information, though practices vary among the *Länder*. There is evidence that school education is a significant source of environmental knowledge. This is related to a long-standing policy of promoting environmental education, particularly through the network of "eco-schools".

Public participation in decision making has been strongly influenced by Austria's unique "social partnership", which provides privileged access to formally recognised interest groups of enterprises, employees and farmers. Although not part of the social partnership, active and relatively well-resourced environmental NGOs have contributed positively to decision-making processes, in some cases on the basis of explicit legal provisions. All the *Länder* have established environmental ombudsmen. They are independent of government and uphold the interests of environmental protection on behalf of the local population. While their activities are appreciated by NGOs and the public, they should not be seen as an alternative to legal provisions for access to justice in environmental decision making.

Recommendations

- Promote a more coherent and effective approach to sustainable development by integrating the two sustainable development strategies in a revised federal strategy, engaging the main ministries more actively and strengthening the links between national, regional and local initiatives.

Recommendations *(cont.)*

- Develop a national spatial development strategy involving all levels of government with a view to striking a better balance between new development activities involving additional land conversion and achieving the objectives of the National Biodiversity Strategy.
- Apply integrated assessment and permitting procedures to federal transport projects; assess how the environmental impact assessment process could be further strengthened, taking account of the recommendations made in independent evaluations; identify ways to streamline and reduce the costs of permitting procedures.
- Review the procedures for strategic environmental assessment and regulatory impact assessment to ensure that the results of studies can make a useful and timely input to decision making; further develop supporting tools and guidance, including examples of good practices, and provide training to practitioners.
- Develop a coherent national environmental inspection and compliance strategy involving the federal and *Land* authorities, including a shared information platform, a risk-based approach to enforcement, and sanctions that are proportional to the financial benefits arising from non-compliance.
- Review provisions for access to justice in environmental matters in order to ensure consistency with the Aarhus Convention.

1. Institutional framework for sustainable development and environmental management

Austria is a federal country. It assigns major environment-related responsibilities to the states and municipalities (Box 2.1), and features extensive stakeholder participation in policy making by means of the so-called social partnership (Section 6).

Box 2.1. **Austria's multilevel governance**

Austria is a federal republic made up of nine states (*Länder*). Government responsibilities are shared by three levels of territorial authority: the federation (*Bund*), the *Länder* and the 2 358 municipalities. The parliament has two houses, the *Nationalrat* and the *Bundesrat*. While members of the *Nationalrat* are elected by the entire population every four years, members of the *Bundesrat* are appointed by the parliaments of the *Länder*. The *Bundesrat's* vote can be overridden by simple majority of the *Nationalrat*, except in a few cases that require both houses' approval. Each *Land* has an elected legislature and a state government.

Legislative and executive responsibilities are distributed between the federation and the *Länder* according to the Constitution Act (as amended in 2007). The allocation of powers is understood to be exclusive: a legislative or executive area is exclusively and unambiguously assigned to either the federation or the *Länder*, with no overlap of rule making. Any disputes are solved by the Constitutional Court (OECD, 2010). The federal government has authority over the judiciary, many aspects of economic policy, defence, most educational matters and academia, telecommunications, and much of the health-care system. The *Länder* have authority over planning and zoning codes, nature protection, hunting, fishing, farming, youth protection, and certain issues of public health and welfare; they also have the right to levy certain taxes.

Box 2.1. **Austria's multilevel governance** *(cont.)*

Any *Land* which does not comply with EU legislation and international treaties must be referred to the European Court of Justice before the federal government can override the *Land's* authority and formally require action. Although the process is time consuming, it does act as an incentive for states to comply. To minimise such difficulties, the federal government and the *Land* involved may conclude a treaty of state in cases where the federal government does not have legislative authority to deal with a specific issue but a co-ordinated supra-provincial approach is deemed desirable (OECD, 2003).

1.1. Key institutions

Since 2000, the Federal Ministry for Agriculture, Forestry, Environment and Water Management (hereinafter the BMLFUW, but less formally known as the Lebensministerium or Ministry of Life) has been the main federal body responsible for environmental issues. To a certain extent, the fact that a single ministry covers agriculture and environment has facilitated co-ordination and conflict solving between these two broad policy areas. Overall, the financial resources of the BMLFUW did not suffer substantial cuts in the 2000s, though overall cuts in public spending in the early 2010s entailed reductions to the environment budget in line with those in other ministries. The BMLFUW employed 2 554 full-time equivalent staff in 2011, or 2% of the federal civil service staff. The staff decreased by 81 full-time equivalents between 2009 and 2011. Other federal ministries have some responsibility for environment-related policy issues, such as energy and transport policy and investment, environmental education, and energy taxes.[1]

Environment Agency Austria (Umweltbundesamt) provides technical support to the BMLFUW for the development and implementation of environmental policy. It is also the national centre of collection and processing of environmental data. Environmental data are used for regular assessment of the state of the environment (Section 5), for reporting according to EU and other international obligations, and for regular publications on a wide range of environmental topics. Environment Agency Austria became a limited liability company in 1999, which allowed it to carry out projects for, and raise funds from, government and non-government institutions and private companies.[2] It employs 470 experts. The Austrian Energy Agency provides technical support for energy policy design and implementation, and manages several energy-related programmes, including klima:aktiv (Section 3).

The *Länder* and municipalities have major environmental responsibilities. While legislative powers over water management, chemicals, hazardous waste and forestry (among other areas) are assigned to the federal level, most other legislative and implementation authority rests by default with the *Länder*. Regional and local administrations are the main licensing and inspection authorities, define environmental policy priorities at subnational level, design and implement policy instruments, carry out investment programmes and provide financial assistance for environment-related investments (Chapter 3). Each *Land* has a minister or a ministry responsible for environmental matters, which often co-ordinates sustainable development issues as well. In a few cases, sustainable development responsibility lies with the *Land* governor's office. Municipalities' environment-related responsibilities include water supply, sewerage, municipal waste management and building permits (OECD, 2003).

1.2. Horizontal and vertical co-ordination

As in many other countries, horizontal co-ordination at national level is challenging because several ministries share environmental policy responsibility. The 1986 Law on Federal Ministries (last amended in 2012) gives the BMLFUW co-ordination responsibilities. In practice, several *ad hoc* interministerial working groups discuss issues that need to be co-ordinated, such as environmental permitting of industrial facilities and vehicle emission standards. In some cases, ministerial ordinances require the agreement of other ministries, which forces co-ordination.

The most important mechanism for vertical co-ordination is the Conference of Regional Environment Ministers, in which federal and *Länder* environment officials meet annually to discuss and co-ordinate implementation of federal environmental laws and regulations at *Land* level (e.g. on sustainability, water management, waste management, air pollution). Numerous subgroups meet as well. On several occasions the conference has reaffirmed the need for strengthened multilevel co-operation, and the *Länder* have claimed that limitations on financial resources and personnel remain a problem when they are required to implement federal laws and regulations.

Specific institutional mechanisms to co-ordinate climate change policy have long been in place. The Interministerial Committee for the Co-ordination of Measures on the Protection of the Global Climate (IMC Climate), established in 1991 at what is now the BMLFUW, consists of representatives of the relevant federal ministries, the social partners (Section 5) and the *Länder*. IMC Climate discusses and takes decisions on proposals intended for adoption by the Federal Council of Ministers. The Kyoto Forum, established in 1999, consists of high-level representatives of the *Länder* and of the associations of municipalities and other local areas.

The main institutional arrangement for co-ordinating sustainable development policies at national level is the Committee for a Sustainable Austria, in which states are invited to participate. It was established in 2002 as an interministerial body to steer implementation of the National Strategy for Sustainable Development (Section 2). It consists of about 30 high-level representatives of federal ministries, the social partners and the *Länder*. As of 2010 the committee was co-chaired by the Federal Chancellery and the BMLFUW. A National Sustainable Development Steering Group co-ordinates sustainable development activities among federal ministries.

Other institutional arrangements promote co-operation between the national and subnational levels of government regarding sustainable development. In 2000 the Conference of Regional Environment Ministers established the Expert Conference of National and Regional Sustainable Development Co-ordinators, which meets twice a year. It is made up of 15 civil servants appointed as sustainable development co-ordinators by the federal and *Land* governments. The Actors Network for a Sustainable Austria facilitates networking among national, regional and local sustainable development co-ordinators.

Overall, according to a 2010 report by the Austrian Court of Audit (ACA), responsibilities for sustainable development are not clearly defined and co-operation among the bodies dealing with the topic appears to be complex (ACA, 2010).

2. Policy framework for sustainable development

Austria has set up a comprehensive, albeit complex, framework for sustainable development. This framework is based on two strategies. First, the National Strategy for

Sustainable Development (NSTRAT), adopted in 2002, aimed at integrating the sustainability principle in policies and actions at federal level. It set 20 key objectives in the areas of quality of life, competitiveness, environment and international responsibility. NSTRAT established an overarching governance framework, including institutional co-operation mechanisms (Section 1.2), management rules, indicators and monitoring procedures. It was to be implemented through annual work programmes outlining specific measures and annual progress reports. However, only two such programmes were adopted, in 2003 and 2004, and the last progress report was published in 2006. That year Austria also launched an indicator-based system for monitoring progress towards sustainable development (Section 5).

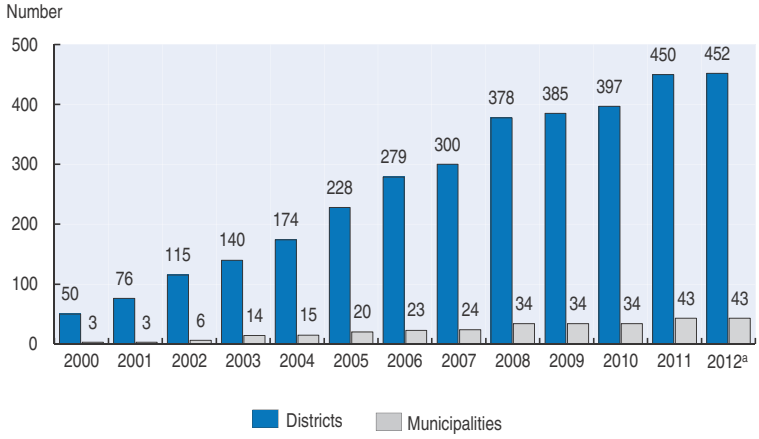
In the second half of the 2000s, the sustainable development focus shifted to developing a strategy that could provide a common framework for policies and initiatives taken at both the federal and *Land* levels. The Council of Ministers adopted the Austrian Strategy for Sustainable Development (ÖSTRAT) in 2010. This was the first time in Europe that a federal country adopted a common sustainability strategy addressing both the national and regional levels (ESDN, 2012). ÖSTRAT reinforced the institutional mechanisms for co-ordination between the national and subnational levels (Section 1.2). It provides for monitoring reports to be published every two years and a full evaluation to be conducted every four years.

The coexistence of two sustainable development strategies has created confusion and hindered effective mainstreaming of sustainable development in decision making. The 2010 ACA report found that, as of 2009, the BMLFUW was the only central government institution strongly committed to the topic and that the *Länder* applied significantly different approaches and organisational frameworks for sustainable development. Sustainable development indicators were being applied only nationally (ACA, 2010). While ÖSTRAT requested all of the states to adopt their own sustainable development strategies, thus far only Tirol has done so, though strategies are under development in Burgenland and Vorarlberg (ESDN, 2012).

The ACA also called for a revision of the NSTRAT, which was taking place at the time of writing. The revision aims to update the objectives and targets of the strategy and to better reflect new and evolving socio-economic challenges in areas such as the greening of economic growth, demographic trends, the financial crisis, employment, education and health.

Both NSTRAT and ÖSTRAT rely on Local Agenda 21 (LA21) processes for their implementation at local level and to allow for broader public participation in policy making. The ÖSTRAT work programmes have a goal of launching LA21 in 600 municipalities and 50 districts by 2013. Local authorities have been launching LA21 processes since 2000, and by 2012 about 19% of municipalities and about half the districts had done so. However, the uptake of LA21 has slowed recently, and reaching the goal appears challenging (Figure 2.1). The BMLFUW oversees these processes and has provided various forms of technical and financial assistance (ESDN, 2012). An interprovincial working group, with participation by the BMLFUW, was established in 2003 to provide support to the processes and elaborate quality criteria for LA21. However, the quality of LA21 processes varies greatly (ACA, 2010), and it is not clear how effective they have been in promoting sustainable development across the country.

Figure 2.1. **Local Agenda 21**



a) Provisional data.
Source: BMLFUW (2013), *Indikatoren für die gesamthafte Bewertung Nachhaltiger Entwicklung in Österreich* (database).

StatLink http://dx.doi.org/10.1787/888932895045

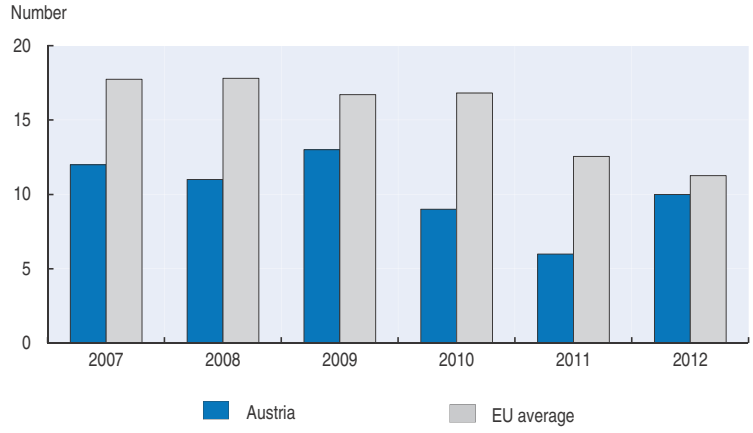
3. Policy framework for environmental management

Environmental policy has a long history in Austria. As in many other countries, the legal foundations of environmental protection are determined by various sector-specific laws. Most environmental policy initiatives and legislation have been developed over many years within the framework of EU directives and multilateral environmental agreements, although in some cases they have anticipated EU and international requirements. This pattern, combined with the partial lawmaking autonomy of the *Länder*, has resulted in relatively fragmented legislation and some implementation problems.

Overall, Austria compares well with other EU countries in developing and implementing EU environmental legislation. Environment is the most challenging policy area in terms of compliance in the EU as a whole: infringement of environmental law accounted for 17% of all infringement cases still open in the EU in 2011 (EC, 2011). For Austria, by contrast, its six active infringement procedures on environmental legislation in 2011 accounted for 9.2% of all its infringement cases.[3] Environmental infringement in Austria was below the EU average between 2007 and 2012 (Figure 2.2). However, as in many other countries, most complaints that the European Commission has received from Austrian citizens and organisations involve claims of irregularities in implementing environmental legislation, especially on impact assessment, access to justice and nature protection (EC, 2011).[4]

As Chapter 3 shows, Austria has made some progress in using market-based instruments for environmental policy. Yet it relies heavily on regulatory instruments and standards. These are accompanied by a number of financial assistance programmes and voluntary instruments, which have been effective in improving environmental performance, although their economic efficiency remains open to question. Education and awareness-raising initiatives at all levels of government have helped build public support for environmental policies (Section 6).

Figure 2.2. **Infringement procedures on EU environmental legislation**



Source: European Commission (2013), Statistics on environmental infringements, http://ec.europa.eu/environment/legal/law/statistics.htm.

StatLink http://dx.doi.org/10.1787/888932895064

3.1. Climate change and energy policy

Austria is a party to the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol.[5] It adopted a climate change strategy in 2002 and has since updated it. In addition, most *Länder* have adopted their own climate change programmes, taking regional circumstances and areas of responsibility into account. The 2011 Climate Protection Act defines the responsibilities of public authorities in reaching Austria's Kyoto target of reducing greenhouse gas (GHG) emissions by 13% from the 1990 level in 2008-12. The act was amended in 2013 to include sectoral reduction targets to 2020. In 2012, Austria launched its National Adaptation Strategy (Chapter 5).

Like other countries, Austria has implemented economic, regulatory and information measures to reduce GHG emissions and achieve its Kyoto Protocol target. Most measures relate to energy and transport (see below), in addition to Austria's participation in the EU Emissions Trading System (ETS) (Chapter 3). A flagship information and awareness programme, klima:aktiv, was launched in 2004 (Box 2.2). In 2011 a new initiative, klima:aktiv pakt2020, was launched, involving large businesses that voluntarily commit to take action against climate change. Nine big Austrian companies have since joined the pact.

Such measures, together with subdued economic performance, helped reduce GHG emissions in the second half of the 2000s. However, 2011 data indicate that Austria was far from reaching its Kyoto Protocol target with domestic measures alone (Chapter 1), and the government committed to purchase 45 Mt of CO_2 equivalent in international emissions. Austria will need to implement additional measures to achieve its target of reducing GHG emissions from non-ETS sectors by 16%, compared with the 2005 level, by 2020.

Austria adopted a new energy strategy in 2010 to align its energy policy with the EU Climate and Energy Package. In addition, it submitted its National Renewable Energy Action Plan to the European Commission in 2010 and its Energy Efficiency Action Plan in 2011. The government has implemented a wide array of measures to promote energy savings and the use of renewables. These include investment subsidies, energy efficiency

Box 2.2. **The klima:aktiv initiative**

The klima:aktiv programme aims to support energy efficiency and increased use of renewable energy sources in all sectors of the economy, thereby reducing GHG emissions and stimulating business and employment opportunities in "green economy" sectors. It is an information-based programme that provides consulting services, information and technical assistance, and education and awareness-raising measures. Financial support is also provided within the mobility subprogramme. The aim is to increase the effectiveness and efficiency of other measures, such as regulations, fiscal incentives and subsidies. The programme is managed by the Austrian Energy Agency and overseen by the BMLFUW. Klima:aktiv has four subprogrammes: mobility, energy savings, renewables, and building and renovation. In all, klima:aktiv, together with other policy measures, contributed to GHG emission savings of 1.4 Mt of CO_2 in 2010.

Klima:aktiv Mobil supports companies and local communities in developing and implementing measures to reduce GHG emissions in transport. It focuses on *i)* mobility management to improve logistics and promote demand-oriented, flexible public transport; *ii)* renewal of the fleet towards cleaner vehicles, such as those powered by renewables and electricity; and *iii)* promotion of cycling and walking. Since 2007, the BMLFUW and the Climate and Energy Fund have provided EUR 56.3 million to 3 800 projects of companies, local governments, schools and tourism operators participating in klima:aktiv Mobil.

Klima:aktiv Mobil also supports the implementation of the Cycling Master Plan, established in 2006. The plan aims at increasing the share of cycling in everyday transport. The BMLFUW has provided financial support to local governments for the development of dedicated programmes. The new master plan for 2011-15 calls for the proportion of cycling to reach 10% by 2015. The new plan includes initiatives such as nationwide awareness campaigns and promoting the combination of cycling and public transport.

Klima:aktiv Energy Savings provides information about energy efficiency of electronic products (through the topprodukte.at website) as well as training, consulting services and audits to consumers and companies that wish to improve their energy efficiency. A related programme called e5 rewards communities that use energy more efficiently and increase their use of renewables. In 2012, 116 communities participated in the e5 programme.

Klima:aktiv Renewable Energy provides know-how and networking to companies and associations on the use of technology such as biomass boilers, solar systems and heat pumps. For example, the Quality Management (QM) heating plant project assists in the planning and construction of efficient biomass heating plants by providing quality management services and expert training. As of 2013, around 1 100 heating plants were registered in the QM project. Registered plants improved their heating efficiency by around 10% on average.

Klima:aktiv Building and Renovation aims at increasing the market share of green buildings in the residential and service sector through measures such as the klima:aktiv building standards. The standards are based on points (e.g. 700 for a klima:aktiv house, 1 000 for a klima:aktiv passive house) that are awarded via certificates of compliance for achieving particular standards or installing certain technologies. In addition to the klima:aktiv standards for residential and office buildings, specific standards for hotels, schools, nursery schools and nursing homes have been available since late 2011.

Source: Austrian Energy Agency (2011).

standards, and feed-in tariffs for renewables-based electricity generation (Chapter 3). Overall, Austria's energy policy has put a strong focus on increasing the use of biomass for heating and biofuels for transport. As Chapter 1 indicates, these policies have helped increase the use of renewables and reduce energy consumption, and Austria is on track to achieve its energy targets.

3.2. Air management and transport

The air management policy framework is well established and fully consistent with EU policy. The Air Pollution Control Act and associated regulations transpose most EU air quality directives into domestic law.[6] The federal and *Land* governments have implemented a number of regulatory measures to reduce air pollution. In the transport sector, regulations include vehicle emission standards, speed limits and bans on driving old cars.[7] Since international transit traffic contributes significantly to air emissions and pollution in Austria (Chapter 1), there are national night driving restrictions for heavy trucks, and such vehicles are banned on some motorway stretches (contrary to advice from the European Commission). A 2012 ordinance provides a basis for low emission zones in Austria. Although such zones have proved effective in reducing air pollution in many European cities, including Berlin and Milan (OECD, 2012 and 2013), attempts to establish them in Austria have encountered fierce local opposition.

Regulations have been accompanied by information programmes, such as the Right Heating initiative providing information about less polluting heating boilers, as well as klima:aktiv Mobil and the Cycling Master Plan (Box 2.2) promoting more environment-friendly transport. Some economic instruments are also in place, such as highway road tolls and vehicle taxes, discussed in Chapter 3. These measures have helped reduce air emissions and improve air quality. However, air quality standards are often still exceeded in some urban areas (Chapter 1).

In 2012 the federal government adopted a national electro-mobility plan. Its implementation is expected to help achieve the 2020 EU target of 10% renewables in the transport sector. In 2012, the Federal Ministry for Transport, Innovation and Technology adopted a new comprehensive transport plan, which sets quantitative objectives to 2025. These include reducing transport emissions of CO_2, $PM_{2.5}$ and NO_X, increasing the share of freight transport by rail and increasing the use of public transport and electric cars.[8] The plan also highlights the need to better reflect environmental costs in road transport prices and to better co-ordinate land-use and transport planning to ensure widespread access to transport services.[9]

3.3. Waste management

Austria has been at the forefront of waste management policy. Many measures, such as those to divert biodegradable municipal waste from landfills, were adopted in Austria before the respective EU legislation came into force (EEA, 2013). The key federal law is the 2002 Waste Management Act: it and related regulations establish a countrywide regulatory framework for management of both hazardous and non-hazardous waste, and set out a waste management hierarchy in line with EU waste policy.[10] In addition, all nine *Länder* have their own laws on collection, charges and treatment of non-hazardous waste.

The Waste Management Act requires the BMFLUW to draft a federal waste management plan at least once every six years. The latest plan was approved in 2011. To promote waste prevention and recovery, the ministry launched a prevention and recycling strategy in 2006 and adopted a prevention programme in 2011. In addition, the 2012 Resource Efficiency Action Plan established a policy framework for achieving the target of improving resource productivity by 50% by 2020.

Austria relies on a mix of regulatory and pricing measures for waste management. It is one of the few countries in which all municipalities impose waste charges based on amount of waste generated (EC, 2012). Austria progressively implemented a landfill ban for untreated waste between 2004 and 2008, accompanied by an increased landfill tax and an incineration tax (Chapter 3). This policy mix helped achieve very positive results in waste management, although municipal waste generation grew faster than private consumption for most of the 2000s (Chapter 1). There are also some regional differences in performance, possibly associated with differing policy approaches at state level. A survey for the European Commission shows that Austria has performed well on all core elements of waste management but decoupling, tying with the Netherlands for the top ranking among EU countries (BiPRO, 2012).[11]

3.4. Water management

The Water Control Act is the main law on water management in Austria. It was revised in 2003 to transpose the EU Water Framework Directive (WFD; 2000/60/EC) into national law and take into account the EU integrated approach to water management. In line with the act, the BMLFUW is responsible for integrated water resource management in the Danube, Rhine and Elbe river basin districts, although local authorities have much implementation responsibility.

As required by the Water Control Act, the BMLFUW launched the WFD-based monitoring programme in 2007 and, in co-operation with the *Länder*, adopted the National River Basin Management Plan in 2009. This plan identifies water bodies that do not meet the chemical and ecological status required by the WFD. It sets timelines and policy measures to achieve the WFD goals, with deadlines in 2015, 2021 and 2027.[12] The government estimates that restoring the ecological status or potential in Austria's water bodies will cost up to EUR 1 billion. The ministry has also released catalogues of best practices to reduce pressures from urban wastewater, from agriculture and from hydrological and morphological processes, and to better integrate water protection issues in hydropower development. The catalogues also include basic information from which to calculate costs and benefits of measures.

Implementation of the EU Nitrates Directive (91/676/EEC) with the adoption of the Nitrates Action Programme in 2003, and of the EU Urban Wastewater Treatment Directive (91/271/EC) helped reduce agricultural, urban and industrial discharges of pollutants into water bodies (Chapter 1). The federal government provided investment subsidies for municipal and industrial wastewater treatment plants, for co-operative actions by farmers, and for restoring the ecological status of water bodies. In addition to standards and subsidies, Austria extensively applies water charges to cover the costs of water supply and wastewater treatment services (Chapter 3).

The BMLFUW has been active in analysing potential effects of climate change on the ecological and chemical status of water bodies. It also has adopted a flood risk reduction

strategy, which largely anticipated the EU Flood Directive (2007/60/EC). The strategy reflects the high political priority on this issue, especially after the devastating floods of 2002 (Chapter 5).

3.5. Biodiversity

Nature protection is mainly the responsibility of the *Länder*, although the federal government is responsible for forest management. In 2005, the National Biodiversity Commission adopted an updated National Biodiversity Strategy, setting an overall goal of stopping biodiversity loss in the country.[13] Its priorities are compatible with those of the United Nations Convention on Biological Diversity, which Austria ratified in 1994. While the strategy was developed at national level, implementation largely rests with the *Länder*, which can adopt fairly different management approaches (EEA, 2012). A participatory process was launched in late 2012 with a view to delivering a new biodiversity strategy in 2013.

Austria has also adopted strategies and plans targeting specific aspects of biodiversity management, such as the 2004 Action Plan on Invasive Alien Species and the 2010 Austrian National Park Strategy. The strategy aims at strengthening management of natural protected areas and sets goals to be achieved by 2015. Protected areas are at the core of Austria's nature management policy. They cover 28% of the territory, which is among the largest shares in the OECD (Chapter 1). Categories and management of protected areas vary greatly among the *Länder* (EEA, 2012).

The policy mix for biodiversity conservation and sustainable use is mainly based on regulation, voluntary instruments and subsidies. The latter include a series of agri-environmental programmes, the latest adopted in 2007, to provide financial support to more environment-friendly agricultural practices, such as organic farming, thereby reducing the impacts of agriculture on biodiversity, land and water. Austria is among the European leaders in organic farming and has nearly reached its national target. Nevertheless, indicators suggest that the policy mix has not been sufficient to improve biodiversity conservation status and reduce land conversion and fragmentation (Chapter 1). Co-operation among government levels and mainstreaming of biodiversity concerns in other policy areas, including transport and climate change, remain insufficient.

3.6. Land-use planning

Each *Land* has its own legislation on spatial planning and local authorities draw up land-use plans, including urban plans and detailed zoning regulations. The Austrian Conference on Regional Planning, bringing together representatives of the federal government, the *Länder* and local communities, draws up ten-year documents known as the Austrian Regional Planning Concepts. National spatial planning is closely linked to forestry planning through the Forestry Development Plan, which sets long-term priorities for each of several defined functions of woodland (economic, social, soil protection, leisure, protection against natural disasters).

Overall, strengthened co-ordination between government levels and better integration of regional land-use planning with other policies appear to be needed. The national goal of limiting the growth of new built-up areas, to reduce the loss of natural space and biodiversity, has never been met. Urban sprawl has continued and has resulted in intensification of commuting (Chapter 1). Regional planning and transport policies also need to be better integrated to ensure that settlements are well connected to public

transport. Austria could consider developing a national spatial development strategy, including all stakeholders at the municipal, *Land* and federal levels to improve governance and reduce loss of natural space (OECD, 2013).

4. Environmental permitting, enforcement and compliance

4.1. Environmental standards and permitting

In general, environmental standards and requirements are set at federal level and applied uniformly throughout the country, although there are exceptions (e.g. standards for household heating installations). In well-founded cases, subnational authorities can impose more stringent requirements, or temporarily relax requirements (e.g. on wastewater standards), to adapt them to the local environmental context. Responsibilities for licensing of industrial installations are split between the federation and the states. It is sometimes difficult to identify the law applicable to a specific installation (Milieu, 2011).

Austria, like other EU countries, must issue permits compliant with the EU Directive on Integrated Pollution Prevention and Control (IPPC; 2008/1/EC) for installations with potentially significant environmental impacts.[14] Permits include limit values and may prescribe the use of best available techniques to prevent or reduce pollution of water, air and soil. Like many countries, Austria aligned its national legislation with the directive after considerable delay (EC, 2005).[15] There was also some delay in granting permits, despite acceleration of permitting:[16] Austria had issued 74.4% of required permits by the 2007 deadline for existing installations (Entec, 2009). Performance later improved: by 2009, Austria had granted 93% of required permits, compared with an overall EU average of 89.7%.

Austria revised its general binding rules, which pre-dated adoption of the IPPC Directive, to reflect best available techniques.[17] At federal level, the introduction of integrated permitting and the application of general binding rules helped streamline licensing procedures and increase transparency and public access to information. Several permitting procedures have been integrated, and the Environmental Impact Assessment Act provides for joint permitting and assessment (Section 4.2).

Nevertheless, as in other EU countries, permits are not always, or sufficiently, based on best available techniques (EC, 2010a). In addition, Austria experienced difficulties implementing the IPPC Directive for reasons including the increased costs of the licensing process and pressure on strained human resources, especially before the 2007 deadline for existing installations. In many cases the directive resulted in increased administrative burden and costs for operators and authorities, especially at *Land* level, without clear environmental benefits. The Industrial Emission Directive (2010/75/EU), which replaced the IPPC Directive and several others, is expected to address some of these issues. The BMLFUW expects to complete transposition of this directive in 2013.

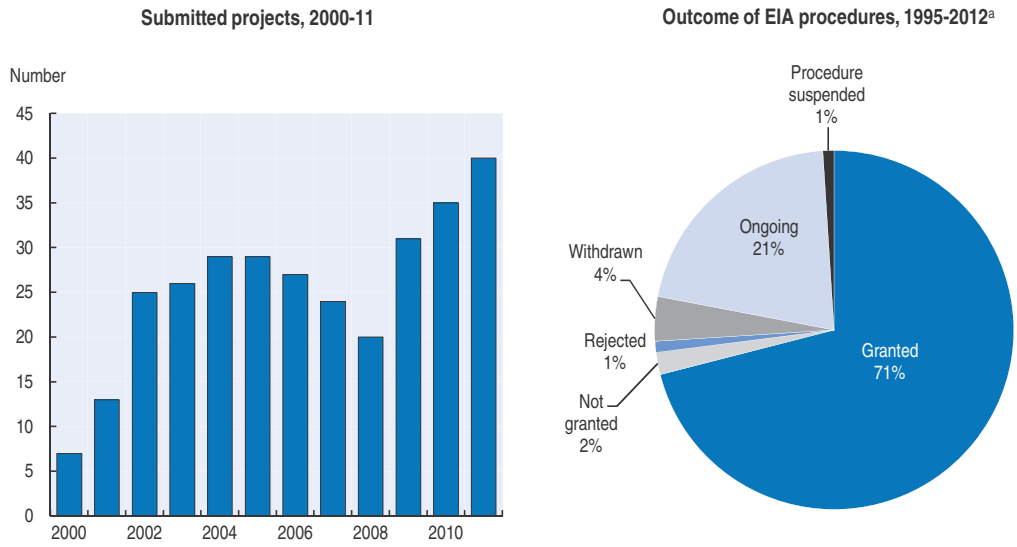
4.2. Environmental impact assessment

A notable characteristic of the Austrian process of environmental impact assessment (EIA) is its "one-stop shop" approach. Only a few other countries, such as Germany, Ireland and the Netherlands, use this approach for some categories of projects (IMPEL, 2012). Projects are subjected to a "concentrated" licensing procedure comprising EIA and all relevant permitting procedures (e.g. air quality, waste management, nature protection). Federal road and high-speed railway projects are excluded from the consolidated

procedure, however, a fact that has negative implications for the duration and costs of procedures, creates legal uncertainty and compromises social acceptance of large transport infrastructure development (ACA, 2012).

Environment Agency Austria participates in each EIA procedure. The BMLFUW reports to the parliament every three years on EIA implementation. The 2012 report points out that, from the time the EIA act went into effect in 1993 until 1 March 2012, a total of 329 EIAs were carried out – 258 on construction facilities or commercial sites and 71 on federal road and high-speed railway projects (BMLFUW, 2012). The number of EIAs grew in the first half of the 2000s after the EIA scope was broadened. Since the mid-2000s, the number has been influenced by trends in wind power investment and Austria's overall economic performance (Figure 2.3). In addition, more than 30 transboundary EIAs were carried out between Austria and neighbouring countries, 14 of which were related to nuclear energy facilities.[18]

Figure 2.3. **Environmental impact assessment procedures**



a) Up to 01/03/2012.
Source: BMLFUW (2012).

StatLink http://dx.doi.org/10.1787/888932895083

Most projects subject to EIA are for large commercial or industrial facilities, which accounted for 27% of projects submitted between 1995 and 2012.[19] Energy projects (mainly wind and thermal power plants), federal roads and waste treatment facilities follow, at 20%, 15% and 10%, respectively. Over 70% of all EIA procedures between 1995 and 2012 concluded with approval of the projects (Figure 2.3). On average, EIA procedures take less than a year to be completed, with some variation depending on project category. The length of procedures has steadily decreased over the years (BMLFUW, 2012).[20]

Although the BMLFUW reports do an excellent job in tracking the number and type of EIAs being carried out, they do not assess the quality of environmental impact studies (e.g. regarding cumulative impacts) or the effectiveness of mitigation measures. Independent EIA evaluation studies commissioned by Environment Agency Austria in 2000 and 2006 found that, while EIAs generally met the legal requirements and contributed to

environmental improvement and to avoidance of conflict between public and private actors in the planning process, there was room for improvement. The 2006 study made twenty recommendations, including: provision of additional capacity (both legal and technical) at *Land* level; expansion of tools and checklists for identifying and assessing environmental impacts; identification of good practices; and provision of funding for participating citizen groups (Klaffl et al., 2006). The extent to which these recommendations have been adopted is not clear.

4.3. Inspections and enforcement

Austria has no central inspection system. The licensing authorities in the *Länder* are also responsible for inspections. Most *Länder* have established inspection plans in conformity with the EU Recommendation on Minimum Criteria for Environmental Inspections (2001/331/EC). Overall, a 2007 report by the European Commission concluded that Austria had partially implemented the recommendation in the first half of the 2000s, although improvement may have occurred more recently (EC, 2007).

The BMLFUW is in charge of inspections related to waste shipment and some waste streams, and retains co-ordination responsibility over enforcement activities.[21] In some cases, experts from the ministry and the environment agency take part in inspections led by state authorities. Joint controls of compliance with waste, water and air regulations are carried out for IPPC installations. Otherwise, inspections are usually regulation- or sector-specific. Some co-operation agreements between the authorities responsible for enforcing different regulations are in place, such as for chemicals and occupational health (Chapter 4). Extending the use of such agreements could help improve the efficiency of inspections.

Data on inspections are incomplete. Available data indicate that inspection staff number about 120 full-time equivalents and that they inspect about 1 000 installations per year, or a third of all installations. The frequency at which each installation is inspected varies from one to six years, depending on the sector and the *Land*.[22] With the exception of waste disposal and recovery installations, compliance with permit conditions is ensured mainly by self-monitoring, complemented by a reporting system.[23]

Results of inspections are systematically documented and communicated to operators. Reports are also accessible by the public. Austrian authorities report that almost all installations comply with the requirement of having a permit and that infringement cases usually concern non-compliance with specific permit conditions (EC, 2007).

Austrian legislation provides for a wide range of responses to non-compliance. Violations of environmental permits most often result in orders requiring the permit holder to restore lawful conditions within a determined time. In addition, infringements of environmental regulations entail so-called administrative criminal sanctions (fines or imprisonment) if the violation results from negligence or intent. The legislation indicates the minimum and maximum amount of these sanctions, depending on the nature and severity of the violation.[24] Environmental deterioration and pollution can also be punished under the criminal code with fines and imprisonment, but only when they result from violation of a regulation or administrative provision. It has been argued that this conditionality provides a weak deterrent (Milieu, 2011).

Overall, sanctions for operating an installation without the required environmental permit or failing to comply with its provisions are in the middle range compared with those applied in neighbouring countries (which have different sanctioning systems).[25] The

revenue from fines is assigned to the authorities of the *Land* where the violations occur. Fines from violations of the Austrian Water Act are used for the inspection and supervision of water bodies and water plants.

The decentralised enforcement system allows state and local authorities to better monitor compliance in their jurisdictions. However, the lack of a national compliance monitoring and enforcement policy results in different regimes being applied across the country. Information on inspections, compliance levels, fines, effectiveness and costs of enforcement is incomplete and fragmented. Introducing a compliance assurance policy at the national level could help reduce both the administrative burden and environmental risks. Steps have been taken in this direction with the establishment of an electronic data management portal for permitting and enforcement activities. A group involving federal ministries and the *Länder* is working on a national environmental inspection system for IPPC installations with a view to implementing the Industrial Emission Directive without delay. The BMLFUW expects implementation of the directive to help strengthen co-operation among inspectors and improve effectiveness of enforcement.

4.4. *Environmental liability*

Austria approved its Environmental Liability Act in 2009.[26] Like many countries, Austria transposed the EU Environmental Liability Directive (2004/35/EC) into national legislation after considerable delay, and implementation has been slow (EC, 2010b). Operators of activities listed as potentially harmful are liable for damage to protected species and to habitats, land and water.[27] They must bear the costs of all measures taken to prevent accidents, and remediate damage when accidents occur. The authorities must take remedial action if an operator cannot be identified or is not in a financial position to act. The legislation does not oblige operators to take out bank guarantees, insurance or other security against environmental damage.

As in most EU countries, businesses are generally not aware of the environmental liability provisions. This applies particularly to small and medium-sized enterprises, most of which had not yet adapted their insurance policies voluntarily to cover environmental liabilities by the second half of 2009; some were not even aware of the existence of a liability regime. This may be due to transposition delays, which caused legal uncertainty and limited awareness-raising efforts (EC, 2010b).

5. Monitoring and evaluation of environmental policy

5.1. *Monitoring and reporting*

Austria has a well-developed system of environmental and sustainable development statistics. In 2006, it launched an indicator-based system to monitor progress towards sustainable development, although this is not directly linked to monitoring the implementation of the two sustainable development strategies (Section 2).[28] Progress reports assessing trends vis-à-vis these so-called MONE indicators have been published every two years since 2007, together with headline indicator reports and summary reports called sustainability barometers. Environment Agency Austria issues a comprehensive State of the Environment Report every three years. The BMLFUW also has reporting obligations to the parliament, for example on EIA (Section 4.2) and on subsidies for environment-related investment (Chapter 3).

Statistik Austria, the central statistical office, has developed and maintains a comprehensive system of environmental satellite accounts in co-operation with the BMLFUW. It includes information on material flows, environmental protection expenditure accounts, the environmental goods and services sector, the National Accounting Matrix with Environmental Accounts (NAMEA) and environmentally related taxes.

In the early 2010s, Austria launched a number of initiatives to measure and monitor well-being beyond GDP, including the environmental components of well-being. The Ministry of Economy, Family and Youth, together with the Austrian Institute of Economic Research, published a study in 2012 which complemented the indicator set of the OECD Better Life Index with additional indicators judged especially relevant for Austrians. Also in 2012, Statistik Austria launched a data set called How's Austria, comprising 30 headline indicators on material wealth, quality of life and environmental sustainability. The BMLFUW, together with Statistik Austria, has also developed a project on prosperity, quality of life and well-being to assess the importance of environment in the well-being of the population (Chapter 1).

All these progress reports, indicators and statistics are made widely and speedily available to the public. However, the ACA reports that they have not been used to assess progress towards objectives of the two sustainable development strategies (ACA, 2010). In general, there is little evidence that monitoring reports and indicators are systematically used to inform decision making.

5.2. Evaluation of plans and policies

Assessment of environmental and sustainable development impacts

Austria has implemented the EU Strategic Environmental Assessment (SEA) Directive (2001/42/EC), although with some delay, and ratified the Protocol on SEA to the UNECE Espoo Convention. There is no framework SEA legislation in Austria, but the requirement of carrying out an SEA is integrated in sectoral legislation, for example on transport and water. The BMLFUW and Environment Agency Austria have set up a website on SEA with guidance on how to implement it (SEA toolkit) and practical examples.

Austria has extensively applied SEA to sectoral plans.[29] While the various SEA provisions clearly specify the obligations to allow sufficient time for public participation and to take SEA results into account in the final decision, it is not clear to what extent these obligations have been systematically applied in practice. In particular, the application of SEA to transport infrastructure plans has been subject to various criticisms. These include the fact that SEA takes place too late in the decision-making process, that comments by the public and environmental authorities receive insufficient consideration and that there is a wide time gap between the assessment process and the actual decision, which results in decisions being made mostly at political level (Konrad and Alge, 2007). Overall, as in most EU countries, in many cases the SEA procedure in Austria results in modifications of plans and programmes, although not always radical ones (EC, 2009).

In 2008 Austria introduced an obligation to submit any new laws and regulations to a Climate Impact Test. The test, now replaced by a revised regulatory impact assessment (RIA) procedure (see below), assessed legislation's potential effects on GHG emissions and on Austria's capacity for response to climate change (Chapter 5). The BMLFUW has begun work on a kind of sustainability impact assessment called the Austrian Pacemaker for Sustainable Development. It is a participative tool for developing policies and legislation in

accordance with sustainable development. It consists of 12 steps, including identifying and assessing the issues that are relevant for sustainable development in the proposed regulation. A pilot project using this tool was carried out on the Austrian Environmental Subsidy Guidelines. It was mainly an awareness-raising exercise; nevertheless, it improved transparency of decision making. Further applications are planned. As recommended by ACA (2010), more systematic application of sustainability impact assessment procedures to policy decisions is needed so that sustainability is considered more comprehensively and at an early stage in decision making.

Regulatory impact assessment

All federal ministries are required to assess the potential financial impact of the legislation and regulations they propose. In addition, as part of its effort to reduce the administrative burdens of regulation on businesses and citizens, since 2007 the federal government has undertaken *ex ante* assessment of the administrative burdens of new federal regulations.[30]

Broader RIA requirements have been in place since 2001. All ministries are supposed to assess the "essential" financial, economic, environmental and consumer protection effects of new legislation and describe them in a statement accompanying draft legislation. However, in practice, there is no systematic mechanism for ensuring that this is done beyond the assessment of financial consequences. While the formal obligations seem to be fulfilled, the quality of assessments or estimations is often questionable. Guidance material on the calculation of costs and benefits of regulatory alternatives is lacking, and there is no effective oversight of the process to ensure compliance with RIA requirements. Overall, resources to conduct *ex ante* assessments have been insufficient and little training has been made available (OECD, 2010).

Some efforts to develop more structured RIA have been made in some states, such as Upper Austria and Vorarlberg. A new RIA system put in place at federal level in early 2013 represents a step in the right direction.[31] Under the new system, federal ministries have to assess all "essential" impacts, including on the environment, in a two-stage process. Only impacts above certain threshold criteria (to be defined) have to be assessed in depth. The development of comprehensive RIA guidance materials and toolkits, including guidance on assessment of environmental costs and benefits, would assist in better implementing RIA.

6. Promoting environmental democracy

Austria has well-developed legal and administrative mechanisms to facilitate access to environmental information, public participation in environmental decision making and access to justice. It ratified the 1998 UNECE Aarhus Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters in 2005, and has implemented the related EU directives. Information about implementation of the convention is available on a dedicated website (*www.partizipation.at*). As discussed in the sections below, Austria has a good performance record in implementing the first two pillars of the convention, on public access to information and public participation in environmentally relevant decision making. It has also made progress on the third pillar, granting access to courts in environmental matters, although there is scope for improvement.

6.1. Public participation and access to environmental information

Public participation

The social partnership system (*Sozialpartnerschaft*) is an important aspect of policy making in Austria.[32] The social partners are four major organisations, representing the interests of employees (Austrian Federation of Trade Unions and Federal Chamber of Labour), farmers and rural areas (Chamber of Agriculture) and enterprises (Economic Chamber of Austria). All have *Land* branches as well.

At both federal and *Land* level, co-operation between government and social partners is a voluntary and informal arrangement not regulated by law, although a number of Austrian laws specify that certain stakeholders or institutions have a right to participate in the consultation process.[33] This co-operation system deals not only with industrial relations but also extends to practically all areas of economic and social policy, including environmental policy. To a large extent, the social partnership is manifested informally and confidentially, and is not normally accessible to the general public. These formally recognised interest groups thus have a *de facto* privileged voice in policy making.

Austria has continued to promote citizen involvement as an element of policy making and administration. In 2008, an interministerial working group, including representatives of interest groups, non-government organisations (NGOs) and experts, drafted standards for public participation, which were adopted by the Council of Ministers. While the standards are not binding, it is recommended that all federal and state authorities use them in developing policies, regulations and legislation. Public consultation normally follows standardised procedures (Box 2.3).

Environmental NGOs have been long active in Austria (OECD, 2003). As of 2012, 40 organisations were formally accredited to take part in EIA procedures, including two umbrella organisations: the Umweltdachverband and the Ökobüro.[34] Total membership in environmental NGOs and alpine associations is estimated to be 20% of the Austrian population. Several legal provisions explicitly call for consultation with environmental NGOs in decision making, including those regarding EIA, SEA, the WFD, and permitting and licensing procedures. In addition, information on permits has to be made available to the public.

Access to environmental information

Austria has a long tradition of providing environmental information to the public. Its Environmental Information Act dates back to the early 1990s and was amended in 2004 to transpose the EU Directive on Public Access to Environmental Information (2003/4/EC). The federal law and corresponding state laws specify procedures for providing access, generally free of charge, to environmental information held by government institutions and agencies. They also provide the basis for the federal and *Land* environmental information systems, the provision of data online and the preparation of state of the environment reports (Section 5.1). A pollutant release and transfer register has also been established, enabling citizens to get information via the Internet on pollutant emissions from industrial facilities (Chapter 4). An e-government working group established in the context of a platform called Digital Austria is working to further improve dissemination of environmental information via the websites of government authorities.

Box 2.3. **Public consultation procedures**

Public consultation at the federal level usually consists of two phases. The first, called "anticipated consultation round", often takes place informally. At this stage only the most central stakeholders (generally the social partners, the *Länder* and the ACA), are consulted by the ministry proposing the law or regulation.

A more open and formalised consultation usually follows. It involves a larger number of organisations, to which a first draft of the legislation, resulting from the first phase, is presented. The 2008 standards for public participation recommend a consultation period of six weeks, which can be extended if the regulatory proposal is very complicated or controversial, or it involves a wide range of stakeholders. Each lead ministerial department usually puts its regulatory proposals on its website. All proposals that are in consultation are also published on the website of the parliament.

Feedback and comments from consultations are considered by the lead ministry and integrated as appropriate in the draft bill. The extent to which comments are taken into account at this stage varies. There are generally no obligations or rules about providing feedback on how consultation outcomes have been considered in finalising the legislation or regulation. Feedback is ordinarily provided informally to the stakeholders. Prior to the submission of a draft bill to the government for decision, there is no central control of the quality of the consultations carried out. Bills are not expected to be returned for reconsideration if consultation has not been done correctly.

After the submission of the bill to the parliament, no public consultation takes place except in cases of politically sensitive and controversial regulations, for which the parliament may organise public and/or expert hearings.

Source: OECD (2010).

While complete national statistics on requests for information are not available, the Austrian authorities report that inquiries have generally increased, especially concerning major projects of environmental relevance. In 2007-08, Environment Agency Austria received about 4 000 requests, mainly related to chemicals, biocides, transport, waste and contaminated sites. It has been observed that the better the quality of environmental information publicly available online, the fewer requests are made to the public authorities. In general, Austrian institutions and agencies have been responsive to requests for information, with relatively few cases of rejected requests, long handling time or resort to courts, although experience among the *Länder* varies.

6.2. Environmental education

Austria has a long-standing policy of promoting environmental education at all levels of education. It has taken part in several EU and international environmental education networks. In 2008, it adopted the Strategy for Education for Sustainable Development, jointly drafted by the environment and education ministries, which promotes innovative approaches.

Many policy initiatives date back to the 1980s and 1990s. They include the establishment of the Forum for Environmental Education, which operates as a specialised agency for the promotion of environmental education projects. The Fund for Health Education and Education for Sustainable Development provides financial support to

environmental education in schools. With annual outlays of EUR 140 000, it has financed about 2 000 projects since its inception in 1992.

The network of "eco-schools" (Ökolog) remains Austria's flagship environmental education initiative. Based on a whole-institution approach, it merges development of education activities with environmental commitment and performance of the participating schools. The Ökolog network, involving more than 380 schools, is supported by the Ministry for Education, the Arts and Culture and the Forum for Environmental Education.

In the 2000s, Austria launched or relaunched environmental performance and education awards for schools and higher education institutions. The awards also take a whole-institution approach. There has been widespread and growing interest in these contests, as the increasing number of participating institutions shows.[35]

As in other countries, schools appear to play a central role as a source of knowledge about environmental issues. Fifteen-year-olds who participated in the OECD Programme for International Student Assessment (PISA) reported that they mainly learnt about environmental issues at school, with shares ranging from 59% on energy shortages to 81% on air pollution. It also appears that school education is a more significant source of environmental knowledge in Austria than on average in the OECD (Table 2.1). The vast majority of Austrian 15-year-olds surveyed were aware of environmental issues and reported that these issues represented a serious concern for them and other people in the country (OECD, 2009).

Table 2.1. **School as a source of learning about the environment**

Environmental issue	Austria[a]	OECD[a]
Air pollution	80.6	75.7
Extinction of plants and animals	76.5	70.1
Clearing of forests	75.4	64.4
Nuclear waste	63.2	58.4
Water shortages	62.8	58.6
Energy shortages	59.3	59.6

a) Percentage of 15-year-olds in PISA 2006 responding that they learn about environmental issues in school.

Source: OECD (2009).

6.3. Access to justice

Austria has not adopted legislation specifically applying the Aarhus Convention provisions on access to justice in environmental matters. The authorities claim that the existing system protects individual and collective environmental interests and that other remedies exist, such as the environmental ombudsman.

Every *Land* has an environmental ombudsman, an institution greatly appreciated by NGOs. Most ombudsmen do not answer to the government and are quite independent (Milieu, 2007). The ombudsmen's primary aim is upholding the interests of environmental protection on behalf of the local population. They ensure that the general public and environmental NGOs are informed about, and involved in, consultations on EIA and nature protection. The ombudsmen are parties to proceedings, and can be held liable if their lack of participation results in environmental harm. They also have the power to bring complaints related to compliance with environmental administrative procedures before

the administrative courts. As a result of regional differences in legislation, however, the various *Land* environmental ombudsmen do not all have the same powers.

The public (individuals, NGOs and other groups) is allowed to report presumed violations of environmental law to the authorities, who decide whether to initiate a procedure. Citizens can also appeal administrative acts and decisions to the local Independent Administrative Senates.

However, Austrian legislation provides no administrative procedure for public access to justice in environmental matters. In general, the public does not have legal standing in administrative and civil procedures regarding public environmental interests: standing is reserved to those whose private interests are at stake. Only in cases concerning waste facilities, IPPC facilities and EIA decisions do some registered NGOs have the right to resort to courts, but other members of the public have no such right. Legal standing was partly extended to registered NGOs within the framework of the environmental liability regime (Section 4.4). Although the environmental ombudsmen can represent the public to some extent, the system is quite restrictive in granting access to courts (Milieu, 2007; Justice and Environment, 2010).

In addition, while Austrian administrative procedures are generally not expensive, in practice the costs can be prohibitive. EIA proceedings, for example, require the acquisition of costly technical and legal services to analyse the documentation and appear in court.[36] In this regard, the idea of establishing a public participation fund, to provide funding for legal aid and expert opinions for NGOs or local groups participating in EIA procedures, has been put forward.

Notes

1. Among others, the Federal Ministry of Economic Affairs, Family and Youth is responsible for energy matters at the federal level; the Ministry of Transport deals with transport policy; the Ministry of Finance sets energy taxes; and the Ministry of Education shares responsibility with the BMLFUW on environmental education.
2. In addition to its own annual budget (EUR 15 million), Environment Agency Austria receives EUR 10 million annually from the BMLFUW and about EUR 9 million from other sources, such as private companies and the EU.
3. The policy areas in which Austria has experienced serious challenges in implementing EU directives are transport, internal market and services, and enterprise and industry (EC, 2011).
4. Complaints do not necessarily lead to infringement procedures.
5. Austria ratified the UNFCCC in 1994 and the Kyoto Protocol in 2002.
6. These include the NEC Directive (2001/81/EC) and the Air Quality Directive (2008/50/EC). Other pollutant- and sector-specific acts were aligned with the relevant EU legislation: the Solvent Ordinance was amended to transpose the Decopaint Directive (2004/42/EC) and the Ozone Act was revised to transpose the Directive on Ozone in Ambient Air (2002/3/EC). The Motor Vehicles Act adopts EU vehicle emission standards.
7. Speed limits stricter than the national level on highways have been enforced in Tyrol since 2010. Bans on driving old cars (registered before January 1992) are in effect in Burgenland, Lower Austria, Tyrol and Vienna, and one is being introduced in Styria.
8. For example, by 2025, rail should account for 40% of freight haulage, and transport emissions of CO_2, $PM_{2.5}$ and NO_X are to decrease by 19%, 50% and 70%, respectively, from their 2010 levels.
9. For example, the plan indicates that by 2020 half of all new buildings should be within 500 metres of an existing or planned public transport stop.
10. Waste prevention, preparation for reuse, recycling, recovery and, finally, disposal.

11. The core elements surveyed were decoupling of municipal waste generation from household final consumption expenditure; practical implementation of the waste management hierarchy; application of economic and regulatory instruments to move up the waste hierarchy; adequacy of treatment infrastructure and quality of infrastructure planning; fulfilment of targets; and infringement procedures.
12. Good chemical status is to be restored by 2015 for 4 water bodies, by 2012 for 5 others and by 2027 for the remaining 11; 42% of natural water bodies are to achieve good ecological status by 2015, 50% of rivers and all lakes by 2021 and the remaining rivers by 2027, with priority given to restoring fish migration and residual flow. The ecological potential of 23% of modified or artificial water bodies is to be restored by 2015, reaching 57% by 2021 and 100% by 2027.
13. The strategy is articulated around four key fields of action: conservation of biodiversity, sustainable use of biodiversity, research and monitoring, and co-operation.
14. The Directive 96/61/EC concerning Integrated Pollution Prevention and Control has been substantially amended several times. It was codified in 2008.
15. In 2004 the European Court of Justice ruled that the Austrian legislation had incompletely transposed the IPPC Directive.
16. The rate of permitting in the two years before the 2007 deadline was more than 11 times higher than in the two previous years (Entec, 2009).
17. General binding rules are limit values or other minimums to be used directly in issuing permits to industrial operators. They are mainly in the form of federal ordinances on emission limit values and also apply to some non-IPPC activities. General binding rules have been established for landfills, waste incineration, treatment of waste oil, combustion plants, sintering of iron ore, production of iron and steel, foundries, production of non-ferrous metals, cement production, kilns for brick production in industrial installations and mining installations, glass production, VOC installations, production of inorganic chemicals and explosives, textile washing, finishing and processing, and manufacturing of timber-derived products.
18. Austria is a party to the 1991 UNECE Espoo Convention on Transboundary EIA.
19. These include recreational or amusement parks, sports stadiums, golf courses, country roads, pipelines, shopping malls and ski areas.
20. The 2012 EIA report indicates that the length of procedures for investment projects (excluding transport) decreased to about 10 months from the more than 12 months reported in 2009. The time required to handle EIAs for transport infrastructure projects decreased by about 1 month, to about 9 months (BMLFUW, 2012).
21. Between 2006 and 2012, the BMLFUW conducted about 22.5 inspections per year on waste management facilities. In addition, the ministry controls transboundary waste shipments and carries out about 100 inspections per year to check compliance with packaging legislation and about 35 related to waste electrical and electronic equipment.
22. For example, *Land* inspectorates have to inspect waste treatment plants at least once every five years.
23. For example, the Austrian Water Act requires operators of wastewater treatment plants to have their plants inspected by external experts at least once every five years, at their own expense. The inspection report is transmitted to the water authority for possible re-examination.
24. For example, violations of regulations related to wastewater treatment plants are sanctioned with fines ranging from EUR 3 630 to EUR 36 340 or imprisonment up to six weeks; infringements of the Waste Management Act are punishable with a fine ranging from EUR 360 to EUR 36 340. In cases of significant violations and serious risks to human health, the authorities can withdraw the operator's commercial and industrial licence and order the closure of all or part of the installation.
25. For example, the maximum administrative fine in Austria is EUR 72 600, compared with EUR 50 000 in Germany. However, environmental criminal offences are punished with a maximum sanction of EUR 1.8 million and five years' imprisonment, compared with EUR 10.8 million and three years in Germany (Milieu, 2011).
26. The federal act covers damage to soil and water. The environmental liability framework also include nine environmental liability laws enacted at *Land* level, which cover damage to biodiversity and land.
27. Fault-based liability or strict liability (i.e. irrespective of compliance with relevant permits), depending on the type of activity and damage.

28. The system includes 82 indicators, of which 26 are headline indicators. They cover two "spheres": man/society and environment.
29. The Federal Waste Management Plan, the Waste Prevention Programme and the National River Basin Management Plan were among the plans for which SEA was conducted.
30. The assessment is based on the standard cost model.
31. As introduced by the 2009 Federal Budget Law.
32. The Austrian social partnership was formed on a voluntary and informal basis to control post-war inflation in the early 1950s. It later developed into a comprehensive system of influence on economic and social policy.
33. For example, the mandatory "right to comment" of the Economic Chamber of Austria is consolidated in legislation.
34. The Umweltdachverband groups 39 organisations with some 1.3 million members, and the Ökobüro represents 16 organisations.
35. For example, the number of universities participating in the sustainability award increased from 13 (42 projects) in 2007 to 22 (77 projects) in 2012.
36. Experience indicates that costs for an EIA procedure for the public concerned range from EUR 10 000 to EUR 30 000 (Justice and Environment, 2010).

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PART I

Chapter 3

Towards green growth

Austria has launched several initiatives related to green growth. This chapter examines Austria's use of taxation policy to pursue environmental objectives and progress in removing fiscal incentives that can encourage environmentally harmful activities. It discusses public and private investment in environment-related services and infrastructure, as well as the use of subsidies to encourage environment-friendly investment. The growth of an internationally competitive environmental goods and services sector is examined along with its potential to serve as a source of economic growth and jobs. Finally, the chapter reviews Austria's efforts to mainstream the environment in development co-operation programmes.

Assessment and recommendations

While sustainable development has provided the main policy framework for promoting integration of economic, social and environmental policies, Austria has launched several initiatives related to green growth. They have mostly focused on the environmental goods and services (EGS) sector, "green jobs" and the links between economic growth and well-being. At the same time, there have been changes in the use of instruments related to green growth.

While regulations, standards and environmentally motivated subsidies remain at the core of Austrian environmental policy mix, the use of economic instruments has been extended. This has helped improve pricing of environmental externalities, although the potential gains of environmentally related taxes and charges have not been fully realised. There is scope to restructure and extend the use of taxes and charges, and to reform environmentally perverse subsidies. This could form part of a broader "socio-ecological tax reform" to reduce the relatively high taxes on labour, promote growth and employment, and contribute to the government's fiscal consolidation programme.

Revenue from environmentally related taxes has increased significantly over the last decade, and now accounts for a larger share of GDP and total tax receipts than on average in the OECD. However, tax rates on petrol and diesel are below the EU average, making transport fuel prices lower than those applied in some neighbouring countries. This price differential has contributed to extensive purchasing in Austria of fuel that is consumed abroad, especially by freight haulers. In turn, this has contributed to increasing emissions of greenhouse gases (GHGs) from the transport sector. While the government has removed some tax rebates on fuel use, other exemptions apply, which can reduce incentives to use energy efficiently. Much of this support favours energy-intensive industry. As in other countries, when energy duties are converted in terms of the carbon content of fuels, they vary greatly among fuels and users. For example, diesel is taxed at a lower rate than petrol. This has contributed to diesel vehicles dominating the vehicle fleet and to increased NO_X emissions. Like all EU countries, Austria needs to efficiently combine energy taxation and the EU Emissions Trading System to provide a consistent carbon price signal across the economy.

In 2008, the car purchase tax was partly restructured on the basis of CO_2, NO_X and particle emission levels, which helped improve the carbon efficiency of the car fleet. However, the bulk of vehicle taxes is levied on the annual car insurance, which is based on engine power. On the other hand, there is some evidence that road tolls for freight vehicles, differentiated by emission category, have helped reduce distance travelled on Austrian highways and have encouraged the uptake of low-emission heavy goods vehicles. However, these tolls do not apply to passenger cars and light commercial vehicles, which account for a significant share of freight traffic, nor to the secondary road network. Other forms of road pricing, such as pollution and congestion charges, are not applied. The favourable tax treatment of company cars, subsidies for commuting to and from work, and free parking for employees, as well as sizeable housing subsidies, encourage private car use, long-

distance commuting by car and urban sprawl. They result in increased fuel consumption and GHG emissions, as well as higher emissions of local air pollutants and greater risk of noise, congestion and accidents. In addition to having negative environmental effects and being a cost to the public budget, these forms of subsidy are regressive, as they favour higher income earners.

Subsidies and capital transfers have also been widely used to reach environmental policy objectives. This is linked to the need to find consensus with the social partners, and to provide incentives for the *Länder* and local authorities to take action in areas under their responsibility. In 2011, environmentally motivated subsidies accounted for more than 40% of general government expenditure on environment, more than four times the average for the euro area. Over time, subsidies' focus has shifted from support for public infrastructure, particularly in the water sector, to leveraging business investment in sectors like renewables and energy efficiency. Generation of electricity from renewables is also supported by feed-in tariffs, whose cost is passed on to final electricity customers. While these support policies have encouraged environment-friendly investment, questions remain about the extent to which such investment would have been made anyway, as well as potential windfall profits, technology lock-in and rebound effects. Fragmented responsibilities between levels of government and lack of co-ordination are also a potential source of inefficiency. This suggests that the overall environmental support policy would benefit from a comprehensive assessment of its cost-effectiveness.

Environmental protection expenditure continued to grow in the 2000s to reach 3.8% of GDP, which is high by international standards. Despite increased climate-related investment, expenditure for waste and wastewater management remains dominant. Pay-as-you-throw charging systems for municipal waste are used countrywide and broadly allow recovery of service costs. Waste charges, extended producer responsibility programmes and a landfill/incineration tax have helped increase recycling rates, reduce disposal in landfills and extend private participation in the waste sector. However, charges appear to be too low to provide sufficient incentives for waste prevention in households. Charges are also widely used in the water sector. However, the level of cost recovery is relatively low, particularly for water used in industry and agriculture, partly due to their relatively low use of public water supply and wastewater treatment infrastructure. The level of private sector participation is limited, and water supply and wastewater treatment infrastructure is largely publicly financed.

The combination of a robust environmental policy framework and substantial financial assistance has fostered the development of a strong, innovative EGS sector. In 2011, the sector accounted for 10.8% of GDP and 4.8% of total employment. In recent years, exports of environmental technology have grown faster than manufacturing exports as a whole. There is some evidence that the EGS sector has contributed positively to job creation. In 2010, the environment ministry launched the Masterplan Green Jobs with the goal of creating 100 000 additional jobs in the sector by 2020. Austria should take account of the structural changes involved in greening its economy, and broaden the policy focus from promoting green jobs to enhancing labour market capacity in this transition. In part this would involve co-ordinating environmental and labour market policies so that new entrants to the labour market, and workers leaving declining industries, have the skills needed to work in a greening economy.

The strength of Austria's EGS sector is also linked to good eco-innovation performance. Indicators of innovation in environment- and climate-related technologies have been particularly impressive in recent years, and put Austria among the most eco-innovative countries. As in many countries, there has been a shift in focus from environmental management to climate- and energy-related technologies. The eco-innovation policy mix largely relies on supply-side measures, including support to research and development. However, demand-side instruments, including standards, labelling and green public procurement, have played an increasing role. Further progress is dependent on addressing a number of issues, some of which are embedded in the general framework for innovation policy. These include a fragmented governance structure, the multiplicity and potential duplication of financing mechanisms, and the resource and financial obstacles facing small and medium-sized enterprises.

Austria's net official development assistance (ODA) dropped significantly in the late 2000s. In 2012, it was equivalent to 0.28% of gross national income, well below the EU intermediate target of 0.51% for 2010. Budget cuts make it unlikely that the 2015 international target of 0.7% will be met. Despite declining ODA flows, bilateral aid for environment, renewables, and water and sanitation grew markedly over the last decade, indicating a strong commitment to the environment within development assistance. However, environment-related programmes accounted for 11.5% of total sector-allocable ODA in 2010-11, which is low compared to many other members of the OECD Development Assistance Committee. The 2009 Strategic Guidelines on Environment and Development provide the reference framework for mainstreaming environmental objectives in development co-operation at the federal level. Project screening is the main tool used to ensure mainstreaming. However, environmental impact assessment and strategic environmental assessment have not been consistently undertaken. Staff and expertise for dealing with environment- and climate-related issues remain limited in Austria's development co-operation system, underlying the importance of focusing on a limited number of priorities to ensure aid effectiveness.

Recommendations

- Extend the use of environmentally related taxes in the framework of a comprehensive "socio-ecological tax reform" that *i)* establishes an effective carbon tax on fuel used in the sectors not covered by the EU Emissions Trading System; *ii)* further restructures vehicle taxes so that they better reflect the environmental cost of vehicle use; *iii)* ensures that other, non-carbon-related externalities are adequately priced; and *iv)* reduces the tax burden on labour.
- Analyse the potentially negative environmental impacts of existing subsidies and tax benefits, possibly in the context of the annual government review of budgetary support; reform environmentally harmful subsidies such as housing subsidies and energy tax exemptions granted to energy-intensive industry.
- Reduce perverse incentives for car use by revising the tax treatment of company cars and the commuting allowance; consider extending the distance-based road toll system to light commercial vehicles and passenger cars, and to the secondary road network; consider implementing pollution and/or congestion charges in cities suffering from high concentrations of traffic-related emissions.

Recommendations *(cont.)*

- Systematically evaluate the cost-effectiveness of environmental support measures at the federal and subnational levels; streamline the financing mechanisms that support environment- and climate-related investment (including renewables feed-in tariffs) with a view to reducing overlaps and potential windfall profits.
- Strengthen the incentive function of municipal waste charges so that they better encourage waste prevention at household level; gradually increase the contribution of agriculture and industry in recovering the costs of providing water services.
- Continue to promote eco innovation by means of a balanced mix of public support for R&D, demand-side measures (e.g. innovation-oriented standards and economic incentives) and partnership with the private sector; improve co-operation between federal and subnational governments, academic institutions and businesses in implementing eco-innovation policy, including in developing education and training programmes needed in the transition to green growth.
- Further strengthen the environmental component of official development assistance, while progressively expanding total aid in line with EU and international commitment; reinforce the effectiveness of environment-related aid by focusing on a few priorities in line with partner countries' needs and Austria's comparative advantage (e.g. climate change adaptation); apply environmental and strategic impact assessment procedures more systematically.

1. Green growth initiatives

Sustainable development has been the basis of the main policy framework for promoting integration of economic, social and environmental policies in Austria (Chapter 2). While Austria does not yet have a policy framework for green growth, it has launched several related initiatives. In 2010, the Federal Ministry of Agriculture, Forestry, Environment and Water Management (BMLFUW) launched the Masterplan Green Jobs, aimed at creating 100 000 additional green jobs by 2020. It is linked to other initiatives that support Austrian environmental technology and the environmental goods and services (EGS) sector. These initiatives include a master plan aimed at fostering innovation in, and commercialisation of, environmental technology and an export initiative supporting international efforts by Austrian environmental technology companies (Section 6).

In 2008, the BMLFUW, in co-operation with other government agencies and think tanks, launched Growth in Transition, a platform to strengthen dialogue about sustainable growth. It is intended to promote "qualitative growth" (increased well-being and quality of life) rather than GDP growth. Linked to this approach are several programmes to measure well-being (Chapter 2). In late 2012, Growth in Transition organised its second international conference, which concluded with a broad ten-point programme of suggestions to foster the following: sustainable development; quality of life and workplaces; measurement of well-being; renewable energy sources; efficient natural resource use; civic engagement in the political process; generational fairness and social connections; quality of urban and rural living spaces; appreciation of natural assets; and sustainable agriculture (OECD, 2013a).

Overall, the federal government approach to green growth focuses on promoting the EGS sector and green jobs, while stressing the equity and social dimensions of growth.

However, the OECD Green Growth Strategy suggests that an exclusive focus on eco-industry and green jobs is overly narrow. Rather, it suggests focusing on the welfare gains and net employment effects stemming from a broader transformation of the economy towards production and consumption patterns that "foster economic growth and development while ensuring that natural assets continue to provide the resources and ecosystem services on which our well-being relies" (OECD, 2011a). The strategy notes that each country, depending on its level of development, should identify and remove constraints or distortions in the economy that inhibit returns to the investment and innovation that would allow more efficient use of the environment. Such constraints include market prices that inadequately reflect the social costs of environmental damage. Green growth policies should be designed to minimise adverse distributional impacts on vulnerable groups in society and ensure a smooth labour market transition. This means promoting new jobs in emerging green innovative activities, but also facilitating the relocation of workers from contracting traditional sectors to expanding cleaner activities.

2. Greening the tax system

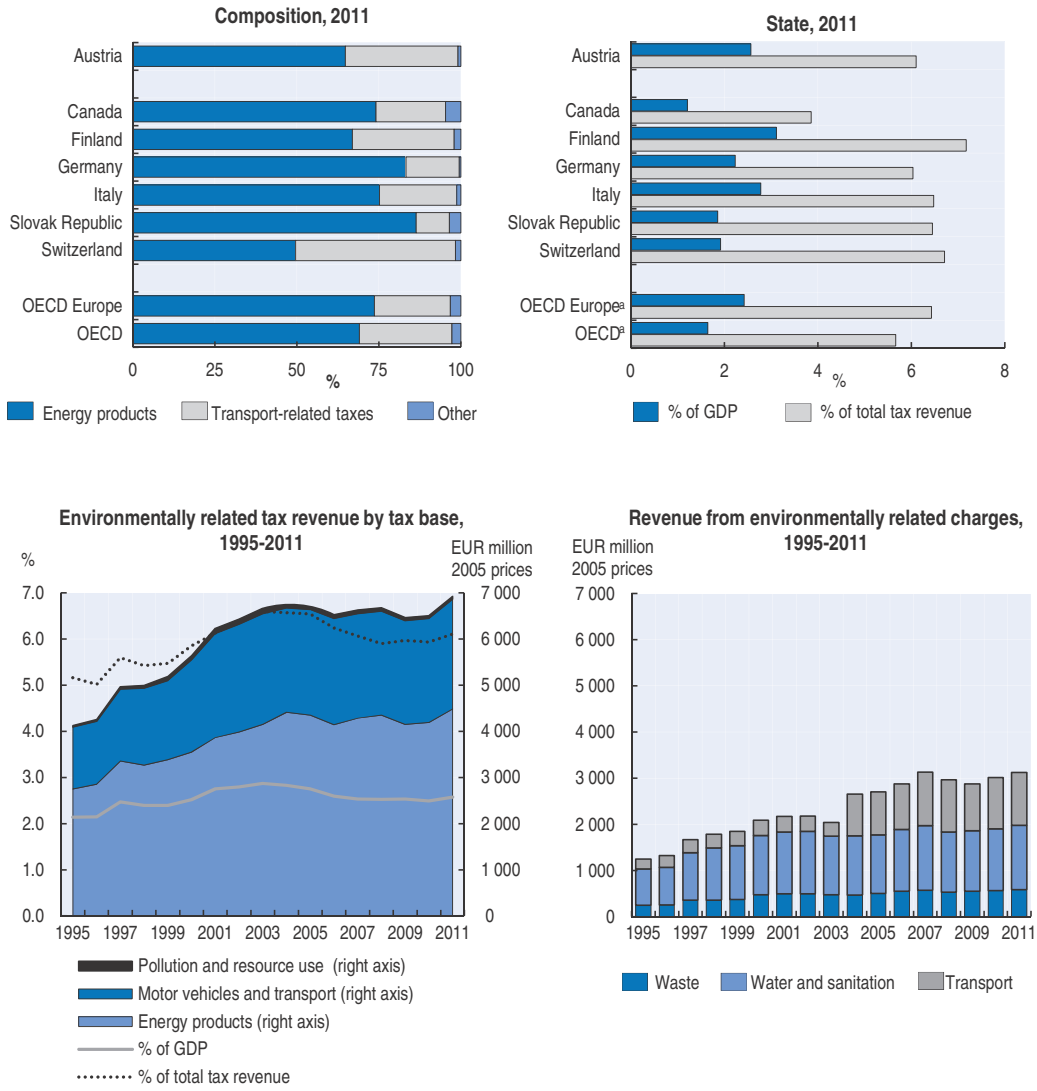
2.1. Overview

Successive tax reforms have helped Austria reduce its tax burden over the past decade. Nevertheless, the tax revenue to GDP ratio (42% in 2011) remains well above the OECD average (33.8%). Compared to the tax mix of many other countries, Austria's is skewed towards labour, notably because of higher than average taxation of individual income and social security contributions (OECD, 2013a). The *Länder* collect the lowest proportion of total tax revenue among the EU countries with federal systems: less than 10% in Austria compared with around 20% in Belgium, Germany and Spain. Local governments receive nearly 12% of tax revenue, which is slightly above the EU average (Eurostat, 2012). The *Länder* and local governments are still far from having effective fiscal autonomy, as they do not have full decision-making powers in regard to most local taxes, and heavily rely on transfers and subsidies from the federal budget.

Revenue from environmentally related taxes increased in real terms by 23% between 2000 and 2011. It stood at 2.6% of GDP and 6.1% of total tax receipts in 2011, higher than the corresponding shares in OECD as a whole. Revenue from these taxes stabilised in the second half of the 2000s, both in absolute terms and as a share of GDP and total tax receipts (Figure 3.1). This was largely due to the declining fuel consumption and energy intensity of the economy, and to a change in the composition of vehicle sales and stock towards smaller vehicles, which are taxed at lower rates (Section 2.3). Rising fuel prices since 2003, and more recent fuel tax hikes, have contributed to the revenue stabilisation by stimulating the shift to smaller, more fuel-efficient vehicles and mitigating transport demand, transit traffic and fuel tourism.

As in all other OECD countries, environmentally related taxes are chiefly taxes on energy products and vehicles (Figure 3.1). At the *Land* and municipal levels, Austria also levies taxes on disposal and treatment of waste (landfill/incineration tax), on hunting and fishing licences and on landscape and nature protection (an example is the tree protection levy in Vienna). However, resource and pollution taxes account for a minor share of revenue from environmentally related taxes (less than 1% in 2011). The landfill/incineration tax provides more than 80% of the revenue from resource and pollution taxes. It is levied per tonne of waste treated or disposed of, at a rate differentiated by waste type

Figure 3.1. **Environmentally related taxes and charges**



a) Weighted average.
Source: OECD/EEA (2013), *OECD/EEA Database on instruments for environmental policy and natural resources management;* OECD (2012), *OECD Economic Outlook No. 91* (database); Petrović, B. (2012).

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(it is lowest for construction and demolition waste) and management method (it is higher for landfilling than for incineration) (EC, 2012a). Biological treatment, recycling and reuse are not taxed. The revenue from the landfill/incineration tax is earmarked for pollution prevention and remediation of contaminated sites. There is evidence that a gradual increase of the tax rate, together with the introduction of a landfill ban for untreated waste, stimulated a shift to thermal treatment of waste (Chapter 1).

Austria extensively applies charges for environmental services such as waste collection, wastewater treatment and water supply, and for the use of roads. Revenue from these charges increased considerably in the last decade, reaching 1.2% of GDP in 2011

(Petrović, 2012). The introduction of a distance-based road toll for heavy goods vehicles in 2004 was the main contributing factor. The role of transport-related charges increased from 16% of charge revenue in 2000 to 37% in 2011. Waste charges account for 19% and water charges for 44%.

Austria should consider further extending the use of environmentally related taxes and charges, possibly in the context of a broader tax reform. The possibility of a "socio-ecological tax reform" has been long debated (OECD, 2003). The Austrian Institute of Economic Research estimated that raising the oil tax, adding a CO_2 tax on all fossil fuels at EUR 30/tonne of CO_2 and increasing the electricity levy could each generate additional revenue of between EUR 0.5 billion and EUR 1 billion per year, depending on the extent of exemptions granted to industries and households (Böheim et al., 2010). Experience in other countries shows that environmentally related taxes can make the tax system more growth-friendly if revenue is used to reduce more distortionary taxes such as those on labour and businesses. The potential gains from this type of approach are significant for Austria in light of its above-average tax burden on labour and the need to finance its strong but costly public sector (OECD, 2013a). More generally, increasing revenue from environmentally related taxes could contribute to the government's fiscal consolidation programme. Measures were taken in this direction in 2011 with the introduction of a flight tax, further adjustment of the car registration tax to reflect vehicles' CO_2 emission levels, an increase in transport fuel excise duties and the removal of fuel tax exemptions.

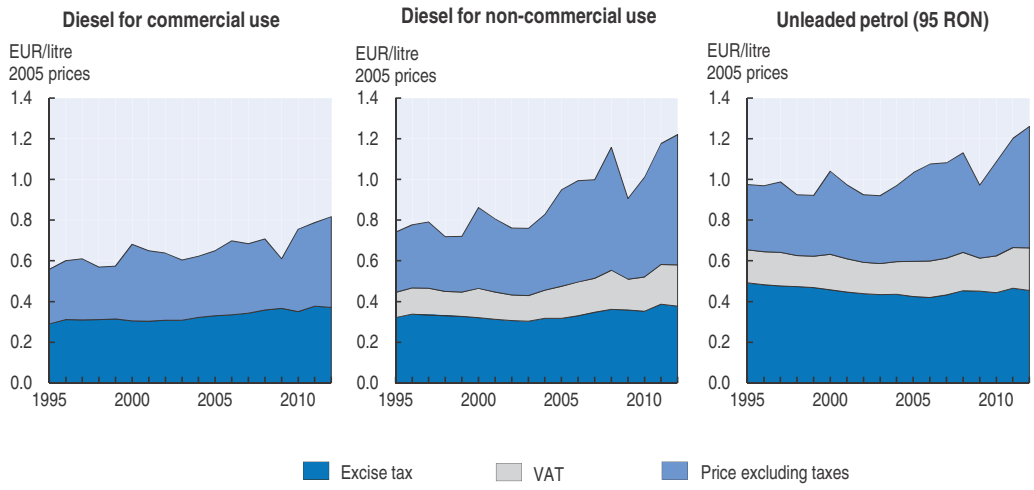
2.2. Taxes on energy products

Taxes on energy products contributed nearly 65% of the revenue from environmentally related taxes in 2011, which is a lower share than in many OECD countries (Figure 3.1). There are duties on all fuels used both for stationary purposes (such as heating and industrial processes) and for transport. A tax on coal was introduced in 2004, and the oil tax on heating fuels has been based on their sulphur content since 2008. As in most countries, revenue from taxes on transport fuels dominates. Excise rates on energy products exceed the minimum levels required under EU legislation, although with a number of partial and total exemptions (Section 3).

Nominal tax rates on the main transport fuels (petrol and diesel) were raised repeatedly in the 2000s and early 2010s, which has prevented their erosion by inflation. Nonetheless, the rise in world oil prices has led to a decline in the share of taxes in fuel prices (Figure 3.2). In 2012, excise duties accounted for 36% of petrol prices and 31% of diesel prices.

Despite the increases, taxes on petrol and diesel remain relatively low in Austria, as do pre-tax prices, making transport fuel prices lower than those in neighbouring countries, especially Germany and Italy. This differential attracts hauliers and drivers from neighbouring countries, who come to Austria to fill up their tanks or do so in transit, contributing to "fuel tourism", i.e. the purchase in Austria of transport fuel that is consumed abroad. International and transit freight transport accounts for about two-thirds of fuel tourism (Molitor et al., 2009). Fuel tourism has contributed to increases in energy consumption and greenhouse gas (GHG) emissions from the transport sector, accounting for about 30% of transport-related GHG emissions (Umweltbundesamt, 2012). Increases in the tax rates in 2007 and 2011 reduced the price gap and, together with the economic slowdown, helped reduce emissions from transport (Chapter 1). Estimates indicate that an

Figure 3.2. **Road fuel prices and taxes**



Source: OECD-IEA (2013), *Energy Prices and Taxes* (database).

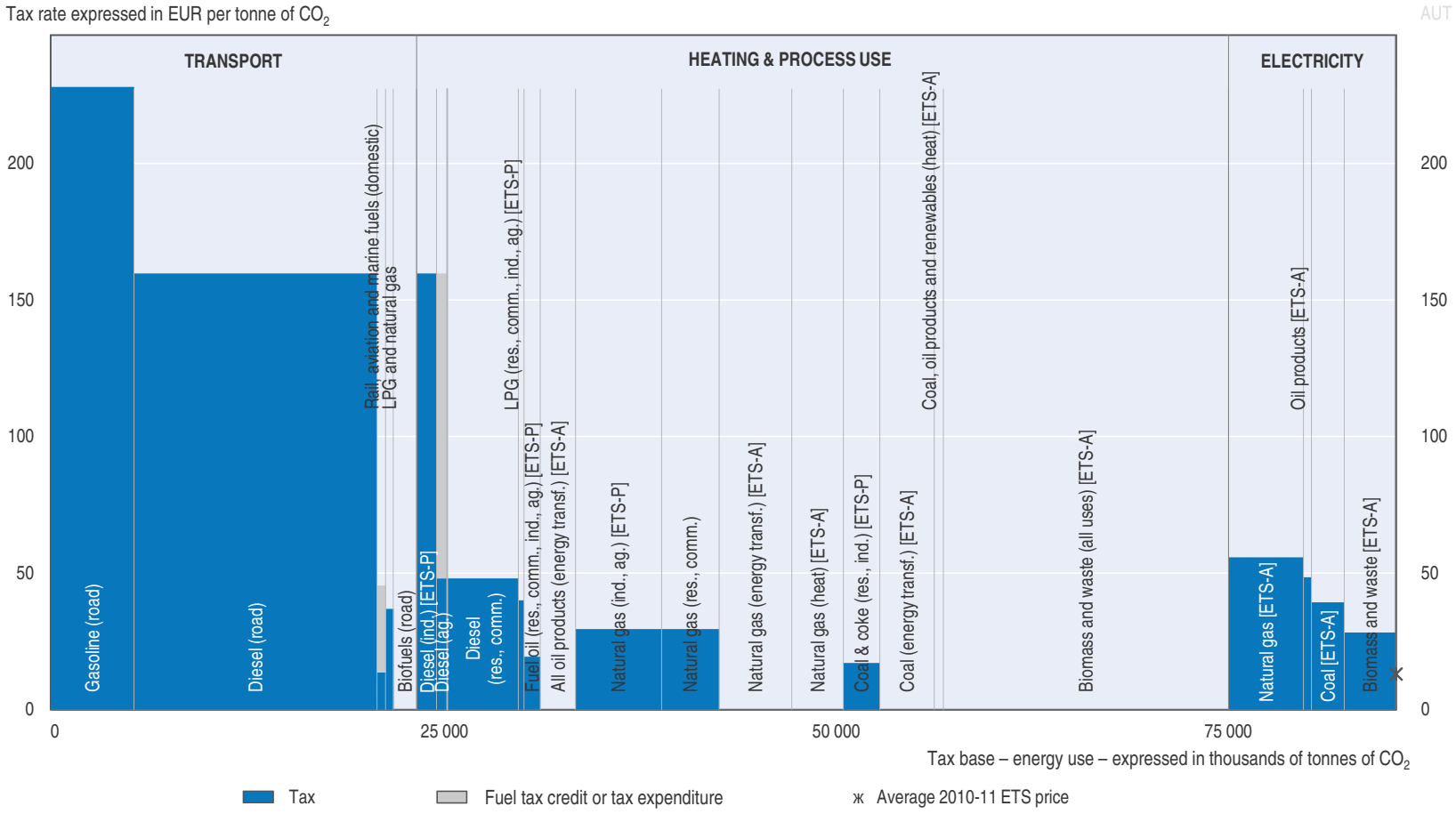
StatLink http://dx.doi.org/10.1787/888932895121

additional tax hike by EUR 0.05/litre would reduce fuel tourism by 10%, resulting in a 1% decrease in GHG emissions by 2020 (OECD, 2013a). Increasing fuel taxes to match fuel prices in neighbouring countries would likely generate extra fuel tax revenue (Molitor et al., 2009).

There is also scope for restructuring tax rates, as current energy taxation does not fully address environmental externalities, including those related to climate change and air pollution. In particular, it does not provide a consistent carbon price signal. As in other countries, when excise duties are converted in terms of the carbon content of fuels and a range of exemptions is taken into account, the duties vary greatly among fuels and users (Figure 3.3) (OECD, 2013b). Diesel is taxed at a lower rate than petrol, despite the fact that diesel has a higher carbon content and its combustion emits more local pollutants, such as NO_x and fine particulate matter. Partly as a result, the share of diesel cars in the fleet has increased considerably, reaching 55% of the stock in 2010. The tax differential has declined over time and the government applied a virtual carbon tax of EUR 20/tonne of CO_2 in setting the tax rate increase in 2011 so that excise duties on diesel were raised more than those on petrol. But the nominal excise duty on diesel was still 17% below that on petrol in 2012, and the differential is 30% if tax rates are expressed in terms of CO_2 emissions.

As in other countries, the excise duties on petrol and diesel imply carbon prices that are significantly above those on fuels used in other sectors of the economy, and well above any CO_2 allowance price that has emerged in the EU Emissions Trading System (Box 3.1). These higher implied carbon prices could be justified by considering that road fuel taxes are raised for a range of fiscal policy objectives, including paying for road infrastructure costs, and that road transport generates externalities such as congestion, traffic accidents, noise and local pollution in addition to GHG emissions (OECD, 2013b). When these externalities are taken into account, the carbon prices implicit in the petrol and diesel taxes applied in Austria become much lower, and even negative for diesel (OECD, 2013a).

Figure 3.3. **Taxation of energy on a carbon emission basis**



[ETS-A] = all subject to the ETS.
[ETS-P] = partially subject to the ETS.
Tax rates are as of 1 April 2012; energy use is based on IEA data for 2009.
Abbreviations: Res. = residential; comm. = commercial; ind. = industrial; ag. = agricultural; fish. = fishery; energy transf. = energy transformation; heat = merchant heat.
Source : OCDE (2013), *Taxing Energy Use: A Graphical Analysis.*

Box 3.1. **Austria's participation in the EU Emissions Trading System**

The EU Emissions Trading System (ETS) was launched in 2005. It now covers about one-third of Austria's GHG emissions (76% of industrial emissions and 88% of emissions from energy industries) and more than 200 installations and large power plants, as well as emissions from airlines flying to and from Austrian airports. In the first two trading periods (2005-07 and 2008-12), Austria, like all other participating countries, set a cap on emission allowances and assigned them to installations on the basis of two national allocation plans.

Austria, like most EU countries, overallocated allowances to industrial installations covered by the ETS in its first national allocation plan. Allowances were allocated for free. The overallocation of permits was less serious in Austria than in other countries: the difference between freely allocated allowances and verified emissions was 0.3% of allocated allowances in Austria, compared to the 1.7% average for all participating countries. Austria was one of the few countries that experienced verified emissions higher than allocations in at least one year of the first trading period. There is some evidence that the ETS, together with (to some extent overlapping) measures promoting renewable energies and energy efficiency, helped reduce emissions from the energy sector between 2005 and 2007 (BMLFUW, 2010).

The national emission cap for the second trading period was nearly 7% below that of the first period, on an annual basis. A negligible share of allowances was auctioned. The allocation was above Austria's verified emissions in every year of the second trading period except 2008. Overall, the surplus of allowances was higher in Austria than on average in the market (4.6% of allocated allowances in Austria and 1.3% in the whole ETS), although with differences by sector. Industrial emissions continued to be far below the allocated allowances, while the opposite was true for the power generation sector.

Despite the tighter cap in the second period, Austria and the rest of Europe experienced a growing surplus of allowances, which has led to a collapse in the allowance price and significantly weakened the price signal. This was largely due to the economic crisis that began in late 2008, which heavily depressed emissions and demand for allowances.

In an effort to enhance the effectiveness of the system, the functioning of the ETS was changed in a number of respects for the third trading period, which started in 2013. In particular, the cap was further tightened and made EU-wide, and auctioning is set to cover a progressively larger share of allowances. However, projections indicate that the surplus of allowances will continue for most of this trading phase, potentially undermining the ability of the ETS to meet the EU GHG emission reduction targets cost-effectively. The allowance price may continue to be too low or too volatile to provide sufficient incentives to invest in low-carbon technologies. Like all EU countries, Austria needs to combine energy taxation and the ETS to fully internalise the environmental externalities associated with GHG emissions and to provide a clear price signal across the economy. To minimise the cost to society, energy product taxation and the ETS should be combined in a manner that avoids both gaps and double regulation (Braathen, 2011).

2.3. Transport taxes and charges

Austria has long applied a range of taxes on vehicles, covering purchase, ownership and insurance. These taxes are partly designed to influence the composition of the fleet towards cleaner and more fuel-efficient vehicles. In 2008, the purchase tax on passenger vehicle, already based on fuel consumption parameters, was modified to include a bonus/

malus mechanism based on CO_2, NO_X and particle emission levels: the tax is reduced for alternative-fuel vehicles (e.g. natural gas, biofuel, hydrogen or hybrid engines) and vehicles with CO_2 emissions below 120 g/km, while higher rates apply for cars with emissions above 150 g of CO_2/km and diesel cars without particulate filters.[1] Electric vehicles are exempt. However, the tax accounts for a relatively minor share of overall vehicle taxation, which may limit its incentive effect. The bulk of vehicle taxation is made up of the annual insurance tax, which is based on engine power only. There is a monthly vehicle ownership tax based on engine power for passenger cars and weight for heavy goods vehicles. This is the only tax applied to heavy goods vehicles.

There is therefore some scope to restructure the vehicle insurance and ownership taxes to take environmental parameters into account, including emissions of CO_2 and local air pollutants, with a view to strengthening their incentive function. Austria could also consider extending the insurance and purchase taxes to heavy goods vehicles. While taxes on vehicle ownership are theoretically less economically efficient than fuel taxes and road charges in reducing emissions (OECD, 2009), the experience of many countries, including Austria, shows that such taxes can encourage drivers to choose cleaner vehicles.

Austria has also increasingly applied road tolls. It introduced a distance-based road toll on motorways for heavy goods vehicles (above 3.5 tonnes) in 2004. Since 2010, the toll has been also differentiated by vehicle emission category, in compliance with EU requirements. There is some evidence that the introduction of the toll reduced distance travelled and stimulated a shift towards the use of heavy goods vehicles with better emission standards (Withana et al., 2012).[2] There are also special tolls for certain roads and tunnels, mainly for Alpine passes. However, light commercial vehicles and passenger cars pay a fixed yearly fee (vignette) independent of distance travelled and emission category. Austria could therefore consider extending distance-based prices to passenger cars and light commercial vehicles, which account for a fairly large share of freight traffic, and to the secondary road network. Steininger et al. (2012) found that extending the system to the secondary road network would help reduce transport related-emissions while fiscal transfers could be used to offset any negative impact on regional economies. Applying pollution and/or congestion charges could also be an option in cities suffering from high concentrations of traffic-related emissions (particulate matter and NO_X) (Chapter 1). This could help rebalance the overall incentives, which, with the relatively low fuel prices, now disproportionally favour private car use (Section 3.2).

3. Removing environmentally perverse incentives

Austria spends large amounts on subsidies and transfers to households and businesses. For example, federal spending on business subsidies and capital transfers accounted for 5.9% of GDP in 2011, more than twice the average in the euro area (2.5% of GDP). This share has barely changed since 2000. It remains above average even considering that more than half of the business subsidies go to public enterprises such as the rail company, hospitals and municipal utilities (Pitlik et al., 2010). Extensive use of subsidies and grants is entrenched in Austria's policy-making environment, which is characterised by a need to reach consensus within the social partnership and to stimulate subnational authorities to take action in the areas under their responsibility (Chapter 2).

There is no comprehensive information on subsidies and tax expenditure that could be environmentally harmful. A pilot study by Statistik Austria estimated that potentially

environmentally harmful subsidies and tax expenditure amounted to EUR 4.9 billion in 2007, or about 1.7% of GDP (Baud, 2009). However, this study has not been followed up. The Ministry of Finance reviews budgetary support annually, but the reports do not assess the potential environmental impact of subsidies. In 2013, the ministry launched an online subsidy database ("transparency database") with the aims of eliminating overlaps of funds and improving transparency, targeting and effectiveness of public transfers. At the time of writing, the database covered only EU-funded support to agriculture and fishing and environment-related funds under the BMLFUW's responsibility (Section 4). Austria could build on the annual reporting and subsidy database to establish a process for the systematic review of environmentally harmful subsidies. This would further improve the transparency of the tax and public expenditure system and could be the basis for subsequent reforms of subsidies and special tax treatment that are not justified on economic, social and environmental grounds.

3.1. Tax concessions on energy use

Austria has made progress in removing tax exemptions and rebates on fuels used in some sectors. The energy tax exemption for liquefied petroleum gas (LPG) used in local public transport, the energy tax relief for diesel used in rail transport and the rebate to diesel used in agriculture expired at the end of 2012.

Other exemptions still apply, however, which lower end-use prices and can reduce incentives to use energy efficiently. They include exemptions on kerosene for non-transport purposes; LPG used to produce electricity; and fuel used in combined heat and power plants, commercial aircrafts and vessels operating on some routes, and in energy-intensive industrial facilities. The energy tax refund to energy-intensive industries was introduced in 1996 and remains the main form of support to fossil fuel use (Table 3.1). It allows businesses to get refunds on taxes on energy use in excess of 0.5% of company value added (businesses have to pay at least the minimum rates stipulated by the energy tax directive). Since 2011, the service sector is no longer entitled to these refunds. In addition, electricity-intensive users are partially shielded from the electricity surcharge associated with the renewables feed-in tariffs (Section 5).

Table 3.1. **Support to fossil fuel consumption**

EUR million

	2005	2006	2007	2008	2009	2010	2011[a]
Energy tax refund to energy-intensive industries	329	379	312	310	374	329	329
Energy tax exemption for LPG used in public transport[b]	4	4	4	4	4	4	4
Energy tax relief for diesel used by trains of the Austrian railways[b]	18	13	15	15	15	10	10
Rebates for diesel used in agriculture[b]	39	39	44	44	49	49	49
Total	390	435	375	373	442	392	392
% of GDP	*0.2*	*0.2*	*0.1*	*0.1*	*0.2*	*0.1*	*0.1*
% of energy tax revenue	*9.0*	*10.3*	*8.4*	*8.1*	*9.9*	*8.6*	*7.8*

a) Preliminary.
b) Phased out at the end of 2012.
Source: OECD (2013c), *Inventory of Estimated Budgetary Support and Tax Expenditures for Fossil Fuels 2013*.

The OECD (2013c) has estimated that special tax provisions on fossil fuel cost the public budget some EUR 400 million per year between 2005 and 2011. This was the equivalent of nearly 8% of energy tax revenue and 0.1% of GDP in 2011 (Table 3.1). The

amount is expected to decrease due to the removal of some exemptions. For example, the Ministry of Finance has estimated that the exclusion of the service sector from the energy tax refund will result in savings of about EUR 100 million per year.

3.2. Perverse incentives to vehicle use

Austria provides favourable tax treatment of company cars and subsidises for travelling to and from work. Company cars used for private purposes increase an employee's taxable income by 18% of the vehicle acquisition cost, independent of car emission standards. A ceiling of EUR 7 200 per year on the maximum increase in the tax base results in higher benefits for bigger, more expensive cars. Fuel costs paid by companies are not taken into account in calculating the employee's tax base. As a result, employees have no incentive to choose more fuel-efficient cars and to limit the use of company cars. The average annual subsidy is estimated at EUR 1 342, which makes it attractive for employees to be paid part of their salary in the form of cars. The number of company cars has risen rapidly over the past decade: over half of newly registered cars are company cars. The revenue loss attributable to this favourable tax treatment was estimated at EUR 609 million or 0.2% of GDP in 2012 (OECD, 2012a).

Employees travelling to work benefit from a tax deduction to compensate for commuting expenses. In 2011, the federal allowance was increased and vehicle taxes reduced to compensate for the latest fuel tax rises. The deduction increases with distance travelled and is higher if public transport is not accessible,[3] which rewards commuters living in areas with bad public transport connections, discourages the use of public transport and encourages workers to live further away from their place of work. It is estimated that the federal commuting allowance overcompensates the real costs of commuting by EUR 80 million. Lost revenue is estimated between EUR 250 million and EUR 320 million per year (Withana et al., 2012). Most *Länder* also make commuting tax breaks available, above and beyond the federal allowance.

In addition to the cost for the public budget, both the tax treatment of company cars and the commuting allowance are likely to have adverse distributional consequences. Company cars are typically provided to middle and higher income earners. Almost half the tax benefit related to the commuting allowance accrues to people with annual income above EUR 35 000, and 10% of beneficiaries have a gross annual income above EUR 70 000 (Withana et al., 2012).

From an environmental perspective, these measures tend to encourage private car use, long-distance commuting and urban sprawl. They result in increased fuel consumption and GHG emissions, as well as higher emissions of local air pollutants and greater noise, congestion and risk of accidents. Estimates for EU countries indicate that company car tax treatment results in an average 4-8% increase in fuel consumption and GHG emissions (Copenhagen Economics, 2010). The OECD (2013d) estimates that the OECD average for environmental impacts of undertaxation of company cars is EUR 112 billion per year. In addition, free parking lots provided by employers raise employees' taxable income by a very limited amount, increasing the incentive to drive to work (mainly at rush hour and to/from particularly congested locations) and exacerbating congestion and environmental problems.

Austrian housing subsidy policy has also contributed to urban sprawl and to increasing land take for settlement and transport infrastructure (Chapter 1), with negative

consequences for resource and energy use and traffic flows. This runs counter to the objective in the Austrian Sustainable Development Strategy of reducing land sealing. In particular, the housing assistance programme (*Wohnbauförderung*), managed by the *Länder*, provides direct subsidies to new homeowners for purchasing or building their home. More than 40% of new homeowners benefit from these funds, which cover a considerable share of the primary residence purchase price. There is evidence that these direct subsidies benefit higher income earners more than those with lower income, who are generally less likely to invest in home ownership (Albacete and Wagner, 2009).

Overall, Austria should consider revising this mix of distorting subsidies, particularly to strengthen the incentive function of road pricing and fuel taxes. As from 2013, employees using a company car for private purposes are no longer entitled to commuting allowances, which is a welcome step. However, the company car treatment should be made less advantageous and possibly linked to vehicles' emission levels, as is done in the United Kingdom. The commuting allowance should no longer be conditional on distance driven and/or should be linked to environmental criteria (e.g. car fuel efficiency) or revised in a way that rewards the use of public transport. Housing subsidies could also be adjusted. While they take environmental considerations such as energy efficiency into account in some *Länder*, subsidies could be made conditional on other parameters such as use of existing buildings and built-up areas and access to public transport. Property taxes, which are relatively low by international standards, could be adjusted to reflect the same considerations. Special fees for land use currently in place in some *Länder* (e.g. Styria) could be extended and set at higher rates for the conversion of undeveloped land.

4. Better targeting environmentally motivated subsidies

Austria has long used public funds to support and stimulate environment-related investment. Extensive use of subsidies and capital transfers is common to most policy areas (Section 3). In 2011, subsidies and capital transfers for environmental protection amounted to a minor share of GDP and to 3.6% of total government subsidies and capital transfers. Nonetheless, they appear to be a major policy tool for reaching environmental objectives: they accounted for more than 40% of general government expenditure for environmental protection in 2011, compared with 9% in the euro area and 12% of total general government expenditure in Austria. This pattern has been relatively stable since 2000.

Similarly, subsidies and capital grants account for 56% of general government expenditure on agriculture, forestry and fishing. A large and growing share of these transfers has targeted more environment-friendly agricultural practices, such as organic farming, mainly through agri-environmental programmes. In 2011, the 2007-13 agri-environmental programme (ÖPUL) disbursed nearly EUR 550 million, equivalent to 70% of public subsidies and capital transfers to agriculture, forestry and fishery. ÖPUL applies countrywide rather than focusing on environmentally sensitive areas. As of 2011, 74% of agricultural holdings, corresponding to nearly 90% of the utilised agricultural area, participated in ÖPUL, a large share by international standards. This subsidy policy has stimulated the uptake of more environment-friendly agricultural practices, helped Austria become an organic farming leader and ultimately resulted in reduced impacts of agriculture on biodiversity, land and water (Chapter 1).

The main budgetary support to environmental investment is the Environmental Support Act. It dates back to 1993, although it has been amended several times. It consolidated a range of subsidy programmes and established a framework for federal environmental support under

what is now the BMLFUW. It also provided for regular monitoring and evaluation of the financial assistance programmes and reporting to the parliament.

The act provides for direct financial assistance to local authorities, industries, farmers and households for investment mainly related to renewable energy and energy efficiency, water management, contaminated sites, transport and mobility (Box 3.2). The operating principle of the act is that support is necessary to stimulate certain environmental investments where the applicant cannot afford the entire investment and needs assistance to close the gap between the basic financing (e.g. secured through commercial loans, co-financing) and that needed to realise the environmental investment; or where the environmental investment is not economically viable because less environmentally sound solutions are cheaper. In the latter case the support is used to tip the balance in favour of the environmental investment (OECD, 2003).

Box 3.2. **Budgetary support to environmental investment**

The subsidy programmes under the 1993 Environmental Support Act provide support for:

- remediation of contaminated sites and groundwater bodies (e.g. former production facilities, landfill sites) and related research projects;
- industrial wastewater management in enterprises;
- municipal water management, including water supply and wastewater treatment projects by local authorities, water associations and co-operatives, groundwater protection, and related research projects;
- "water ecology" investment by local authorities and operators of hydropower plants to restore the continuity of freshwater bodies and upgrade the hydromorphological conditions of the water network;
- environmental investment by private enterprises (*Umweltförderung im Inland*), mainly related to climate change (renewable energy and energy efficiency), air pollution control, noise abatement and the reduction of hazardous waste.

Other environment-related support mechanisms include:

- the thermal building retrofitting initiative, launched in 2011; with an annual budget of EUR 100 million in 2011-16, it supports thermal building renovation projects in the residential and commercial sector;
- the klima:aktiv Mobil subsidy programme, launched in 2007 as part of the broader klima:aktiv programme (Box 2.2); it finances measures by local and provincial authorities, tourism operators and providers of cycling facilities to promote cycling, walking, use of public transport, renewal of vehicle fleets towards cleaner vehicles and implementation of mobility management systems;
- the Climate and Energy Fund, established in 2007, to support projects in energy efficiency, renewables and other measures to reduce GHG emissions in businesses and households.

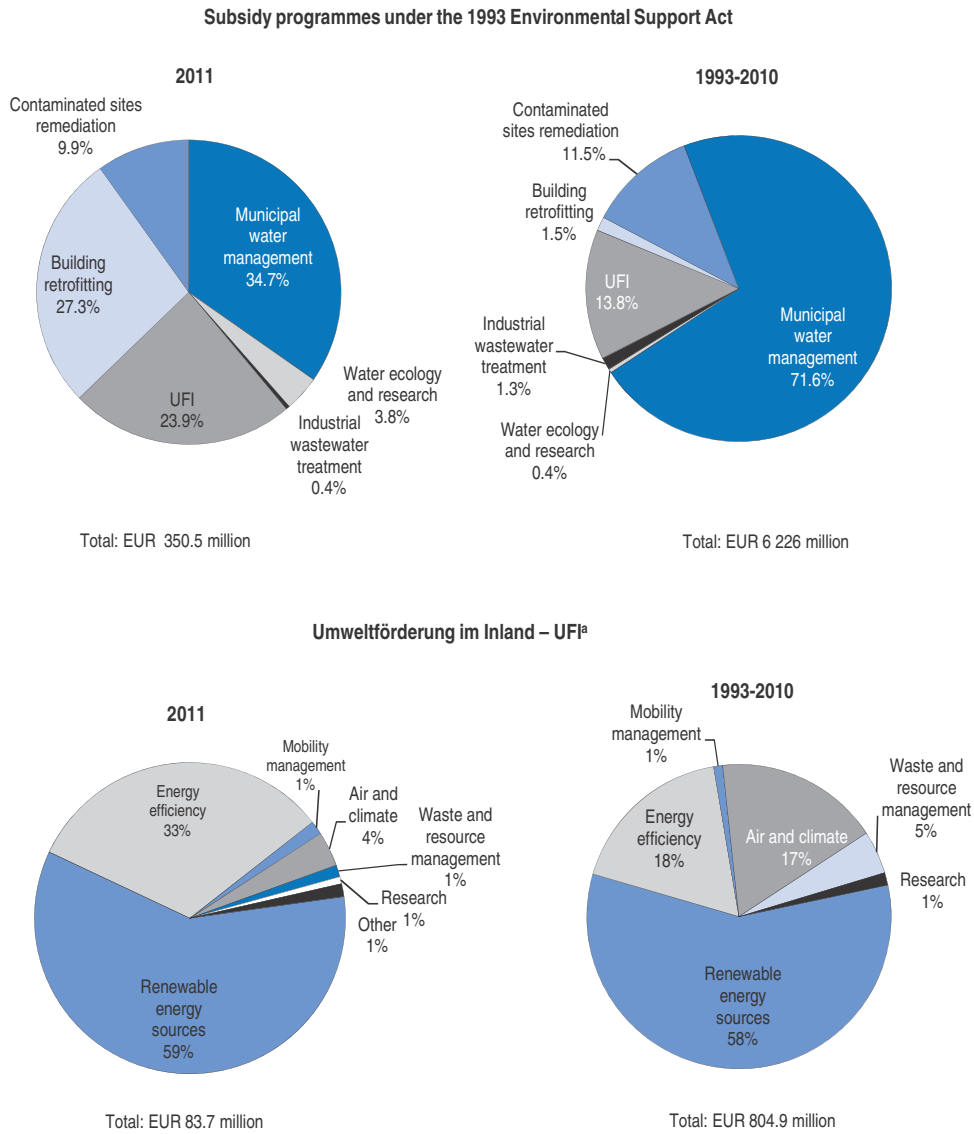
Kommunalkredit Public Consulting (KPC), a subsidiary of a state-owned investment bank, manages the federal subsidy programmes, the EU funds allocated to environmental investment and rural development, and some *Land* support programmes, mainly targeting climate- and energy-related investment. KPC serves as a one-stop shop to which potential investors can apply for several, though not all, subsidy programmes at federal and *Land* levels.

Source: KPC (2011).

The subsidy programmes under the Environmental Support Act provide grants calculated either as a fraction of total investment costs or as a lump sum. The subsidisation rates range between 15% and 30% of investment costs depending on the type of projects. The average subsidy rate has declined over time, with both the revision of the funding guidelines, which reduced the assistance rate per project, and a shift towards smaller projects that benefit from lower financing rate (BMLFUW, 2011).[4]

In 2011, funds provided under the act included EUR 350.5 million in subsidies and supported EUR 2 billion in investment, mostly related to municipal water management, thermal retrofitting of buildings and environmental investment by private enterprises. Over time, the focus of support has shifted from infrastructure development, particularly water infrastructure, to stimulating environment-related investment in the private sector (Figure 3.4).

Figure 3.4. **Budgetary support for environmental investment**



a) UFI: environmental investment by private enterprises.
Source: BMLFUW (2011); OECD calculations.

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About 24% of the grants were disbursed through Umweltförderung im Inland (UFI), which targets private businesses. UFI supported nearly EUR 580 million in investment in 2011, nearly three times as much as in 2000 (BMLFUW, 2011). The vast majority of financed projects were related to renewable energy and energy efficiency, indicating a shift of business investment from air pollution control and waste management to climate-related projects (Figure 3.4). Renewables and energy-efficient and climate-friendly transport projects absorbed an additional EUR 100 million allocated by the Climate and Energy Fund (Box 3.2).

Overall, the federal subsidies programmes listed in Box 3.2 leveraged about EUR 2.5 billion investment in 2011 (KPC, 2011), equivalent to 3.6% of Austria's gross capital formation.[5] Estimates indicate that the financed projects resulted in substantial reductions in resource use, emissions and pollution. In particular, they helped reduce CO_2 emissions by some 12 Mt over the technical life of the investment (KPC, 2011). Most of the CO_2 abatement is attributable to investment in renewables (BMLFUW, 2011). Analyses also indicate that in 2011 the UFI and the thermal retrofitting initiative resulted in GDP growth and employment opportunities that would have not been generated if the funded investment had not been made (Table 3.2). In addition, the cost of the subsidies to the public budget was largely offset by additional tax revenue and savings in labour market support expenditure (BMLFUW, 2011; Kletzan-Slamanig and Steininger, 2010).

Table 3.2. **Economic effects of federal environmental support programmes in 2011**

	Unit	UFI	Building retrofitting initiative
Investment volume	EUR million	578.8	802.5
Financial assistance	EUR million	83.7	95.7
Subsidy rate	%	14%	12%
CO_2 reduction (over investment lifetime)	Mt CO_2	7.8	4.3
Subsidy per avoided tonne of CO_2 emissions	EUR/t CO_2	10.7	22.3
GDP annual change	%	0.14	0.19
Employment effect	Units	8 600	12 038
Additional tax revenue	EUR million	360	503.1
Savings in labour market expenditure	EUR million	110	165.3

Source: BMLFUW (2011); OECD calculations.

These funding mechanisms have been effective in encouraging public and private operators and households to make environment-friendly investment, mainly by lowering upfront costs and making the environmental investment economically viable. However, in addition to being a cost to the budget, subsidies are generally not the most cost-effective instrument to achieve environmental objectives. Taxes that directly incorporate the cost of environmental damage into market prices are generally more efficient to tip the balance in favour of environmental investment, and credit support (e.g. loan guarantee) is more appropriate to address capital market failures (OECD, 2012b). A key problem with government financial assistance is that many beneficiaries would make the investment even without the support. As determining the exact subsidy amount needed to stimulate changes in investment decisions is difficult, subsidy programmes may result in extensive windfall benefits. In addition, by targeting a limited range of "cleaner" technologies or activities, subsidy-based measures encourage firms and consumers to adopt the subsidised solutions even when other options would be more effective. Therefore, they

tend to generate technology lock-in. Finally, as subsidies make the supported activity cheaper, they may perversely increase activity levels and, therefore, use of energy and natural resources and pollution (rebound effect) (OECD, 2012b).

In general, Austria's subsidy policy presents some inefficiency due to fragmented responsibilities between levels of government, lack of co-operation between them and insufficient reporting, especially at subnational level. The OECD (2011b) concluded that "many long-established spending programmes absorb large resources on a routine basis, with constituencies built up with vested interests in their continuation irrespective of social benefit and costs". This is valid for environment-related subsidies, which also potentially overlap. For example, investment in renewables and energy efficiency can be funded by UFI and the Climate and Energy Fund, although co-ordination mechanisms are in place to avoid double funding. Subnational programmes add to this multiplicity of funds. Pitlik et al. (2010) estimated that cutting all-purpose business subsidies and improving their management framework would help save up to EUR 5 billion per year in the long term. While federal funds under the Environmental Support Act are subject to regular monitoring and reporting, the overall environmental support policy would benefit from a thorough evaluation of its cost-effectiveness. This review should include funds disbursed at both the federal and subnational levels. It should consider the extent to which the actual outcomes of subsidised investment projects meet expectations (or desired outcomes) and at what cost.

5. Investing in the environment to promote green growth

5.1. *Environment-related components of the fiscal stimulus packages*

Responding to the global financial and economic crisis of 2008-09, Austria rapidly introduced sizeable stimulus packages at the federal and *Land* levels. The federal packages approved in 2009 and 2010 amounted to about 3.5% of GDP (Breuss et al., 2009). Environment-related measures were estimated at nearly 8% of the total stimulus, or 0.3% of GDP. They mostly involved investment in rail infrastructure and energy efficiency in public buildings (Table 3.3). These measures targeted sectors that were particularly affected by the recession, including vehicles, infrastructure and construction, and helped mitigate the decline in construction investment (EC, 2011a).

Table 3.3. **Environment-related components of the fiscal stimulus packages**

Measure	Description	Budget
Thermal retrofitting (private)	Funding for thermal retrofitting of buildings in the residential and commercial sector	EUR 100 million
Thermal retrofitting (public)	Funding for thermal retrofitting of public buildings owned by the Federal Real Estate Agency (schools, universities, public administration buildings)[a]	EUR 292 million
Car scrapping programme	Contribution of EUR 1 500 for purchasing a new car, minimum Euro 4, and scrapping a vehicle more than 13 years old	EUR 22.5 million
Railway infrastructure investment	Investment in addition to the regular ÖBB Rail Investment Framework Programme 2009-14	EUR 350 million
Broadband infrastructure		EUR 10 million
Total		EUR 774.5 million

a) Assumes that one-third of the budget allocated to the Federal Real Estate Agency (EUR 875 million) was to be used for energy efficiency retrofitting.

Source: Breuss et al. (2009); IHS Global Insight (2010).

Kletzan-Slamanig and Steininger (2010) estimated that thermal retrofitting leveraged EUR 584 million in investment and generated a net increase of about 1 100 jobs. On the basis of these results, the government extended the initiative to 2016. The primary purpose of the scrapping programme was to sustain car sales, although it also helped renew the fleet with more fuel efficient cars. The only environmental requirement, in addition to the scrapped vehicle's age, was that the purchased vehicle had to comply with the Euro 4 emission standard, mandatory in the EU since 2005. The scrapped vehicles were older and more carbon-intensive than on average in European countries that implemented similar programmes, and the average carbon efficiency of newly registered cars reached 150.7 g CO_2/km compared to 154.2 g CO_2/km in a business-as-usual scenario (IHS, 2010). In general, car scrapping programmes are not a cost-effective way to meet environmental objectives such as reducing GHG emissions. In addition, as in many other countries, Austria's stimulus packages included measures that could have negative environmental impacts, such as investment in road construction.

5.2. Expenditure for environmental protection and water supply

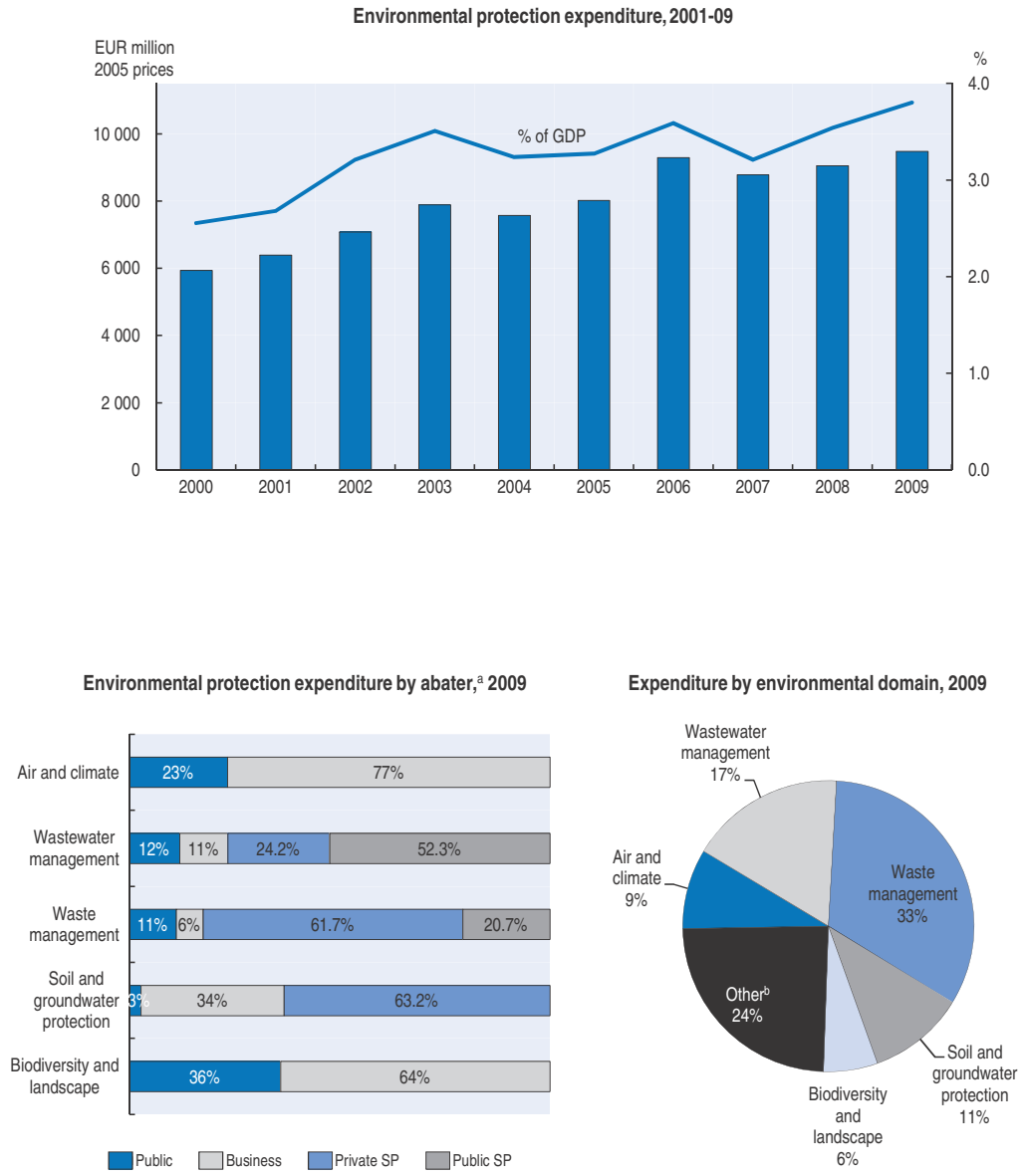
Environmental protection expenditure[6] grew by 60% in real terms between 2000 and 2009 to reach 3.8% of GDP, which is high by international standards. Expenditure grew in all environmental domains, but especially in air and climate protection, soil protection, and biodiversity conservation, albeit from relatively low levels. These three sectors have acquired a progressively larger role, accounting for about 26% of expenditure in 2009 (Figure 3.5). Waste and wastewater management accounted for half of environmental expenditure in 2009. This is down from more than two-thirds at the beginning of the decade, but remains the main item of expenditure. Growth in expenditure was mainly due to an increase in current expenditure. The share of investment in total expenditure declined from 26% in 2000 to 14% in 2009. As in most other developed countries, this trend reflects a rise in spending on operation and maintenance of infrastructure built in the past.

The public sector is responsible for a minor share of environmental protection expenditure (11% in 2009). As in most OECD countries, subnational governments account for the vast majority of government environmental expenditure: local governments about 60% and the *Länder* 14% in 2009. Public and private specialised producers, i.e. entities specialised in the provision of environmental services,[7] accounted for about two-thirds of environmental expenditure on average during the 2000s, followed by the business sector (20%) and the public sector (12%).[8] Specialised producers carried out most of the expenditure in the waste and water sectors and their expenditure increased especially in the second half of the decade (Figure 3.5). This rise reflects growing use of subcontractors to provide environmental services, especially related to waste. As in many European countries, businesses have spent increasing amounts on air and climate protection, carrying out most of the expenditure in this area as a result of a policy focus shift from traditional pollution issues to climate change mitigation.

Waste and water infrastructure and services

Waste treatment infrastructure is well developed and available throughout the country. Private operators are dominant in the waste management industry, accounting for more than 60% of expenditure (Figure 3.5) and 80% of turnover. The *Länder* have responsibility for municipal waste management and charging policies. Austria is among the few EU countries in which pay-as-you-throw charging systems are used countrywide

Figure 3.5. **Environmental protection expenditure**



a) Expenses related to activities directly executed by an economic sector (public sector, business sector, public and private specialised producers (SP) of environmental protection services).
b) Other includes services to buildings and landscape activities and other activities related to engineering consulting, construction, and financial services.
Source: OECD (2013) *OECD Environment Statistics* (database); OECD (2012), *OECD Economic Outlook No. 91* (database).

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(EC, 2012a). In general, charges are based on the size of a household's waste bin and the frequency of collection, and are designed to cover the costs of waste collection and treatment. According to government surveys, cost recovery is generally assured: about 60% of municipalities cover at least 95% of all waste service costs. Extended producer responsibility systems are in place for other waste streams, such as packaging waste, end-of-life vehicles and waste electronic and electrical equipment.[9] Austria is among the few EU countries in which producers cover all or most of the costs of managing such waste. Extended producer responsibility programmes and waste charges have helped increase

recycling rates and reduce disposal in landfills (Chapter 1). However, Austria's charges for municipal waste, while based on volume of waste generated, are relatively low and do not seem sufficient to encourage waste prevention at household level (EC, 2012a).

The role of private operators in the water sector is relatively limited, reflecting a view in Austrian society that water services are of key public interest and should be publicly managed. Public specialised producers, mainly run by municipalities, account for more than half the expenditure for wastewater management (Figure 3.5). Investment in wastewater treatment and water supply infrastructure is largely subsidised by the federal government. In 2011, capital transfers accounted for more than 95% of government expenditure for water supply, a share that has remained stable since 2000. The Environmental Support Act (Section 4) provides the framework for federal subsidies for municipal water supply and wastewater infrastructure and for industrial wastewater treatment. Wastewater treatment investment has absorbed the vast majority of federal transfers since 1993, when the act was approved, and has benefitted from a higher average subsidisation rate (Table 3.4). This is in line with the government priority of extending connections to wastewater treatment plants and reducing water pollution. In 2010, 94% of the population was connected to public wastewater treatment plants, all of which provided secondary and/or tertiary treatment (Chapter 1 and Annex I.C).

As public support aims at keeping end-use prices affordable, the subsidisation rate increases with the investment costs. On average, federal transfers covered 22% of investment costs in water infrastructure, below the average rate registered in 1993-2010 (Table 3.4). This is in line with the general trend of declining subsidisation rates, and is linked to the smaller size of projects (Section 4).[10] Additional subsidies from the *Länder*, loans and equity capital cover most of the remaining investment costs, while fees for connection to the infrastructure account for about 10-15%.

Table 3.4. **Federal subsidies for water infrastructure**[a]

	2011				1993-2010			
	Investment cost	Subsidy	Average subsidy rate[b]	% of total	Investment cost	Subsidy	Average subsidy rate[b]	% of total
	EUR million		%		EUR million		%	
Wastewater treatment	384.7	93.5	24	76	12 853.6	4 053.2	32	89
Water supply	162.6	29.5	18	24	2 661.4	485.4	18	11
Total	547.3	123.0	22	100	15 515.0	4 538.6	29	100

a) Under the Environmental Support Act.
b) Subsidy/investment cost-ratio.
Source: BMLFUW (2011), *Umweltförderungen des Bundes* 2011.

In addition to connection fees, municipalities levy charges that are directly or indirectly linked to water consumption or wastewater discharge. Some municipalities apply a wastewater surcharge depending on pollution load. Municipal charges have to be in a range set by federal regulations and meet regulatory requirements. Estimates indicate that, on average, water charges cover 85% of annual costs to municipalities for providing water services. However, the way in which annual costs are calculated and the extent to which they include investment costs vary across municipalities (Heidler and Prandstetten, 2008). Households contribute 70-75% to cost recovery of water services, industry 20-25% and agriculture 2-5% (EC, 2012b).

5.3. *Investment in renewables and energy efficiency*

Since 2000, Austria, like many countries, has increasingly invested in expanding the use of renewables for electricity generation, heating and cooling, and transport. Energy supply from renewable sources grew by about 23% between 2000 and 2011 and Austria is on track to achieve its 2020 target of 34% as renewables' share of gross final energy consumption (Chapter 1).

A feed-in tariff system, established by the 2002 Green Electricity Act, is the main mechanism for financing renewables development in the electricity sector. Generation of subsidised electricity from renewables, excluding that from hydropower plants up to 20 MW, increased more than elevenfold between 2002 and 2011. Wind, biomass and photovoltaics registered the highest growth rates. In 2011, the feed-in tariff system supported about 10% of the electricity fed into the national grid. As a result, feed-in tariff payments (excluding the average market price of electricity) grew from EUR 139 million in 2003 to EUR 308 million in 2011 (E-Control, 2012).

The Green Electricity Act has been amended several times to adjust the feed-in tariff mechanisms to market developments. To keep costs under control, the annual feed-in tariff payments are capped, with quotas varying by energy source. This can be less cost-effective than a general cap, which would let investors choose the technology. Annual government ordinances set the tariff rates that apply to new plants, which can create some uncertainty for investment planning. The average feed-in tariffs have risen, with the exception of those for photovoltaic plants. In 2011, tariffs averaged between EUR 5.67/MWh (small hydro plants) and EUR 49/MWh (photovoltaic plants), compared to the electricity market price of EUR 5.65/MWh. The cost of the system is passed on to end-users in the form of a surcharge on the electricity price. In 2011, the annual surcharge amounted to EUR 34-40 per household (E-Control, 2012). As in some other countries, such as Germany, electricity-intensive industrial companies are partially exempt from the surcharge. They bear only 3% of the feed-in tariff system costs (BMWFJ, 2011).[11]

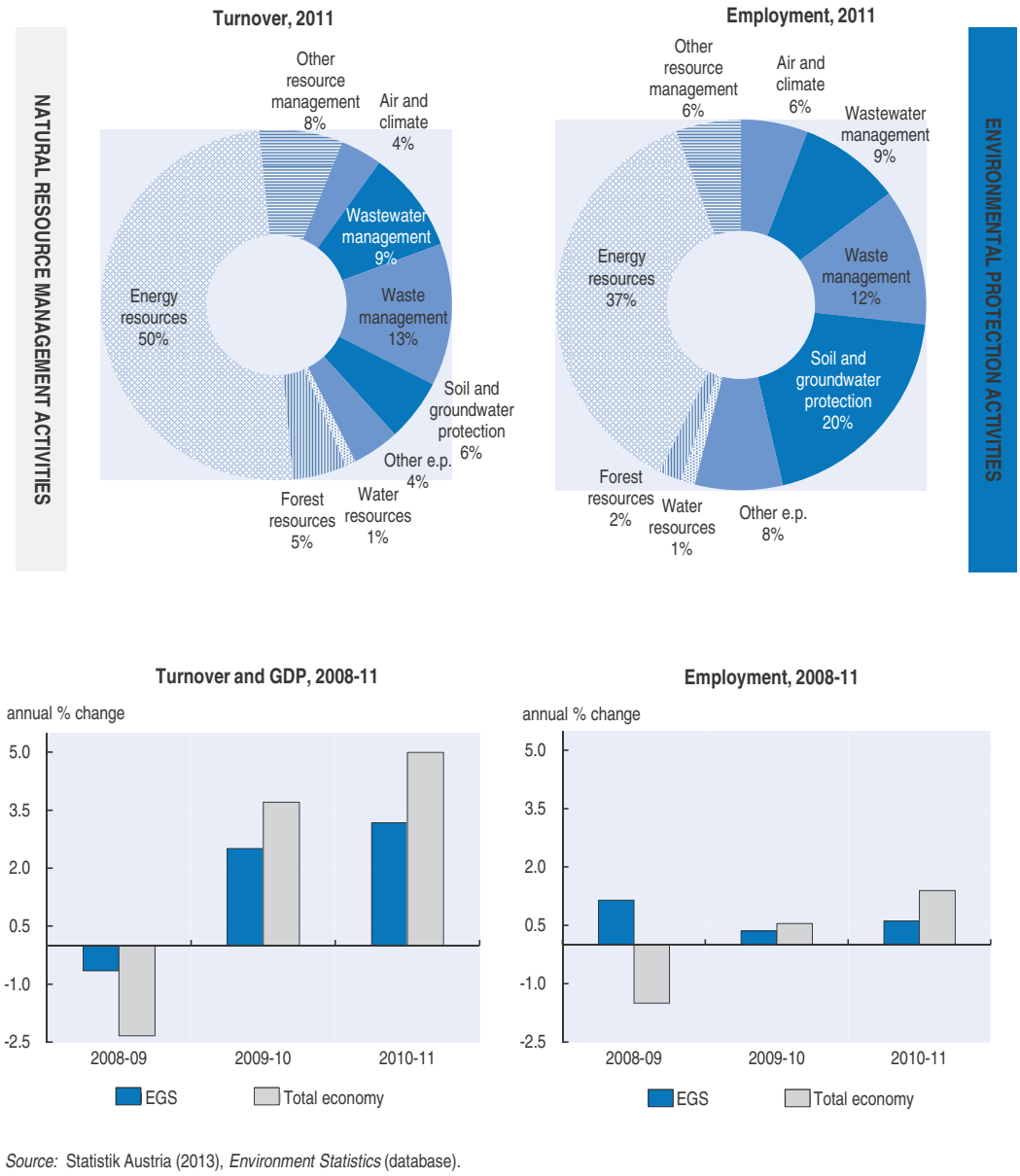
In addition, the federal government has made extensive use of direct financial transfers to promote "clean" energy. In 2011, the Environmental Support Act funds and the Climate and Energy Fund disbursed about EUR 270 million to support investment in renewables and energy efficiency. The corresponding investment totalled more than EUR 1.7 billion, chiefly in energy efficiency and building thermal retrofitting. Investment in renewables targeted mainly photovoltaic systems and biomass heating systems. As Section 4 indicated, the uptake of subsidies for energy- and climate-related investment has grown considerably over time: they represent 68% of all environment-related investment supported by federal subsidy programmes. The *Länder* have provided additional support, for example for building retrofitting that results in higher energy performance than that required under current building standards.

6. Expanding environment-related markets and employment

Long-established environmental regulations and significant financial assistance to environment- and climate-related investment have helped Austria develop a strong, innovative and dynamic environmental goods and services sector.[12] Statistik Austria reported that turnover in the EGS sector totalled EUR 32.6 billion in 2011, equivalent to 10.8% of GDP. This was greater than the contribution to GDP of other important economic sectors such as construction (6.7%) and tourism (5.5%). Employment in the EGS sector reached about 171 245 full-time equivalents in 2011, or 4.8% of total employment.

The EGS sector grew by 5.1% in 2008-11 while the economy as a whole grew by 6.4%. While total employment increased by 0.4%, in the EGS sector it increased by 2%. The EGS sector weathered the 2008-09 recession well: its turnover declined less than GDP did, and employment in the sector grew by about 1% while total employment declined by nearly 1.5% (Figure 3.6). Growth rates vary by activity: some (e.g. protection of biodiversity and landscape, renewables, waste management) grew well above average, while others (e.g. management of wild flora and fauna, protection of ambient air and climate, noise and vibration abatement) shrank.

Figure 3.6. **Turnover and employment in the environmental goods and service sector**



Source: Statistik Austria (2013), *Environment Statistics* (database).

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As in other countries, the EGS sector has undergone a structural transformation in the last ten years, with increasing focus on energy and low-carbon technologies, goods and services. Resource management activities (which aim to preserve and maintain the stock of natural resources) accounted for about 63% of turnover and about 45% of employment in 2011. Environmental protection activities, which aim to prevent, reduce and eliminate pollution and environmental degradation, accounted for most of the employment in the EGS sector (55%) but for 37% of turnover (Figure 3.6). Turnover in the energy management sector far exceeded that in other categories, driven by a boom in both renewables and energy efficiency activities: renewables accounted for 36% of turnover, energy efficiency for 14%. Management of waste and wastewater and soil and water resource protection were the other large subsectors. The renewables industry was the largest employer in the EGS sector in 2011, accounting for about 22% of employment, followed by soil and water protection (20%) and heat/energy efficiency (15%).

Environmental services (e.g. waste and wastewater treatment and energy- and water-saving activities) generated 44% of EGS turnover in 2011. Production of less polluting or more resource-efficient goods, including organic farming products and less polluting vehicles, accounted for 36% of EGS sales. Production of environmental technologies, including renewables technologies, followed with 18%.

Austrian companies are generally export oriented, and this is particularly evident in the EGS sector. A survey by the Austrian Institute of Economic Research indicates that environmental technology exports grew by an annual average of 11% between 2007 and 2011, almost 10% faster than manufacturing exports as a whole. Austrian companies have increasingly diversified towards extra-EU markets, although they remain mostly oriented towards the EU market. Austria's exports accounted for 1.5% of the global market in environmental technology in 2009-11. While this is a relatively minor share, it is slightly above Austria's share of the global market in manufactured goods and comparable to that of other EU countries such as Denmark and Sweden. Other indicators suggest that Austria's competitive position in the sector is strong and improving, also owing to its high research and innovation intensity (Köppl et al., 2013) (Section 7). In 2005, the BMLFUW and the Austrian Federal Economic Chamber launched an environmental technology export initiative to assist EGS companies in developing export markets. By late 2010, about 270 companies had participated in the initiative (Pirgmaier and Schreiber, 2011).

The subsidy programmes for environmental investment discussed in Section 4 have been a key policy tool to stimulate domestic demand for EGS, thereby promoting development of the sector. The government has increasingly provided information on the impact of these subsidies on GDP growth, exports and employment. Often, estimates indicate very positive effects. For example, the building retrofitting initiative generated more than 12 000 jobs in 2011 (Table 3.2); klima:aktiv Mobil has created 4 600 jobs since its launch in 2007; and the renewables feed-in tariff system will result in net employment growth of 64 000 jobs by 2020 (E-Control, 2011). However, it is not always clear how these impacts are calculated and to what extent the various estimates are comparable. It appears that the growth in green jobs is an important factor in discussions about support for environmental and climate-related investment and about environmental policy measures more generally.

In 2010, the BMLFUW launched the Masterplan Green Jobs with the goal of creating 100 000 additional "green jobs" by 2020. This means EGS employment would increase by more than 50% from its 2010 level. The Masterplan focuses on agriculture and forestry, environmental technology and renewable energy, and the tourism and leisure industry.

It identifies six main areas of action to reach the goal: education and training for the environment industry; support to innovation; promotion of networking and co-operation among actors in the green economy (industry, research and education institutes, public institutions, etc.); export promotion; targeted investment and consumer incentives to stimulate the demand for cleaner products, technology and services; and awareness raising. The plan was partly based on an *ex ante* assessment of the potential net employment impact of selected measures. The assessment indicated that nearly 20 000 additional full-time equivalents could be employed, compared to the baseline scenario, by promoting exports of environmental technology, ecotourism and use of agriculture and forestry biomass as an energy and material source. More than two-thirds of the jobs would be in ecotourism (Meyer et al., 2010). The assessed measures were subsequently included in the plan. As part of the Masterplan, a green jobs career portal (green-jobs.at) was established as a hub for job seekers and employers.

Maintaining the positive employment effects of EGS sector expansion will likely require better co-ordination between environmental and labour market policies, with a view to providing workers with the new job skills needed in a greener economy and facilitating their shift from "losing" to "winning" sectors. Effective co-ordination would help keep skill shortages from hampering the effectiveness of environmental policy measures (e.g. energy efficient retrofitting of buildings) and prevent green training programmes from overanticipating demand for EGS and leaving trained workers underemployed. The klima:aktiv initiative (Box 2.2) is a good example of such policy co-ordination (OECD, 2012c): it provides workforce training as part of a package of measures to support green sectors.[13] More generally, Austria could broaden its policy focus from promoting the EGS sector to enhancing its labour market capacity to adjust to the green growth transition. A socio-ecological tax reform could help in this respect: partially shifting the tax burden from labour to environmental "bads" could encourage employment (Section 2).

The growth of green sectors is projected to continue on a global scale in the long term, and Austria is poised to benefit from it. However, unstable economic conditions, the phasing out of stimulus packages and implementation of austerity measures in EU countries may hamper prospects in the short term (Köppl et al., 2013). In addition, competition in international markets, especially from emerging economies, has been intensifying. Austria's capacity to maintain and further develop its competitive position thus will critically depend on technological progress and productivity gains. These would require a strengthened policy framework for promoting eco-innovation (Section 7) and continuous efforts to facilitate access to foreign markets, on the model of the export initiative.

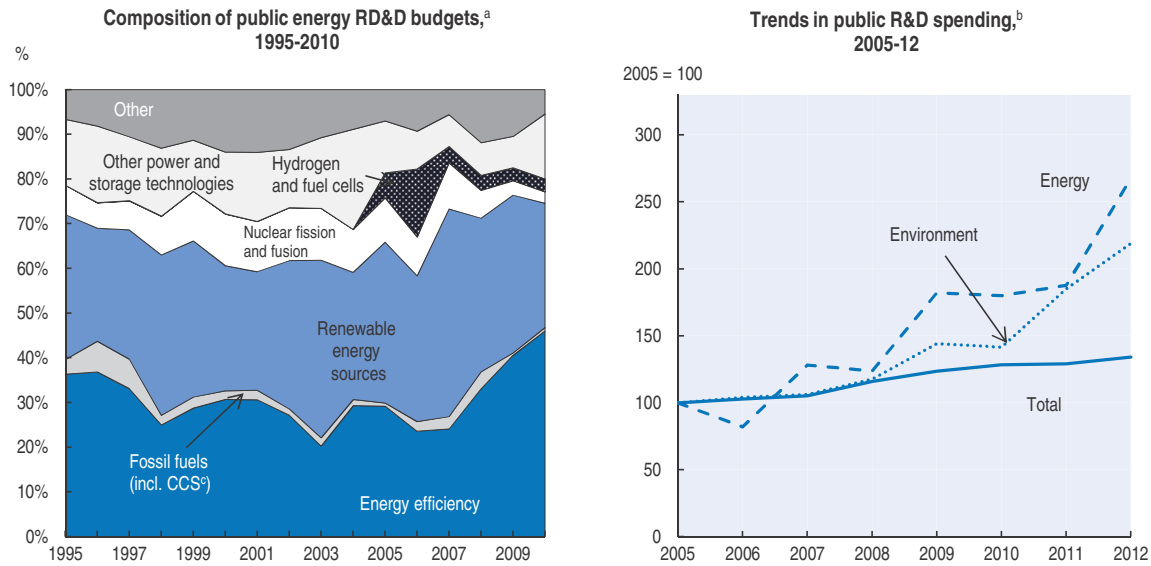
7. Promoting environmental technology

7.1. Innovation in environment-related technology

Austria's innovation performance is among the best in the OECD. In 2011, gross expenditure on research and development (R&D) was 2.75% of GDP, well above the OECD average. It grew by 3.6% a year between 2005 and 2011, the fastest rate in the EU. The 2011 Research, Technology and Innovation Strategy aims to reach 3.76% of GDP by 2020. In 2011, industry funded 45% of R&D expenditure, which indicates sound links between industry and science (OECD, 2012d). With an annual average of 150 patent applications filed under the Patent Co-operation Treaty (PCT) per million population, Austria ranked tenth in the OECD in 2008-10.

While the government R&D budget increased by 34% between 2005 and 2012, the environmental R&D budget more than doubled. It amounted to 2.6% of the overall government R&D budget in 2012, higher than in many other OECD countries. Only the government R&D budget for energy grew more than that for environment, although from lower levels, reflecting the policy priority attached to this sector (Figure 3.7). Outlays for energy efficiency and renewables technologies increased markedly in the late 2000s. These two areas have long dominated energy research, and accounted for nearly three-quarters of the government energy R&D budget in 2012. Businesses perform more than 90% of environment-related research, signalling a high R&D intensity of the environmental technology industry. A survey by the Austrian Institute of Economic Research indicates that for most environmental technology companies, increased investment in R&D has resulted in improved market competitiveness and increased employment (Köppl et al., 2013).

Figure 3.7. **Public R&D spending on energy and environment**



a) Government budgets for Research, Development and Demonstration (RD&D). Based on data expressed in USD at 2011 constant prices.
b) Government outlays for R&D; breakdown according to the NABS 2007 classification. Based on data expressed in USD at 2005 prices and PPP.
c) Carbon Capture and Sequestration.
Source: OECD-IEA(2013), *Energy Technology and RD&D Statistics* (database); OECD (2013), *OECD Science, Technology and R&D Statistics* (database).

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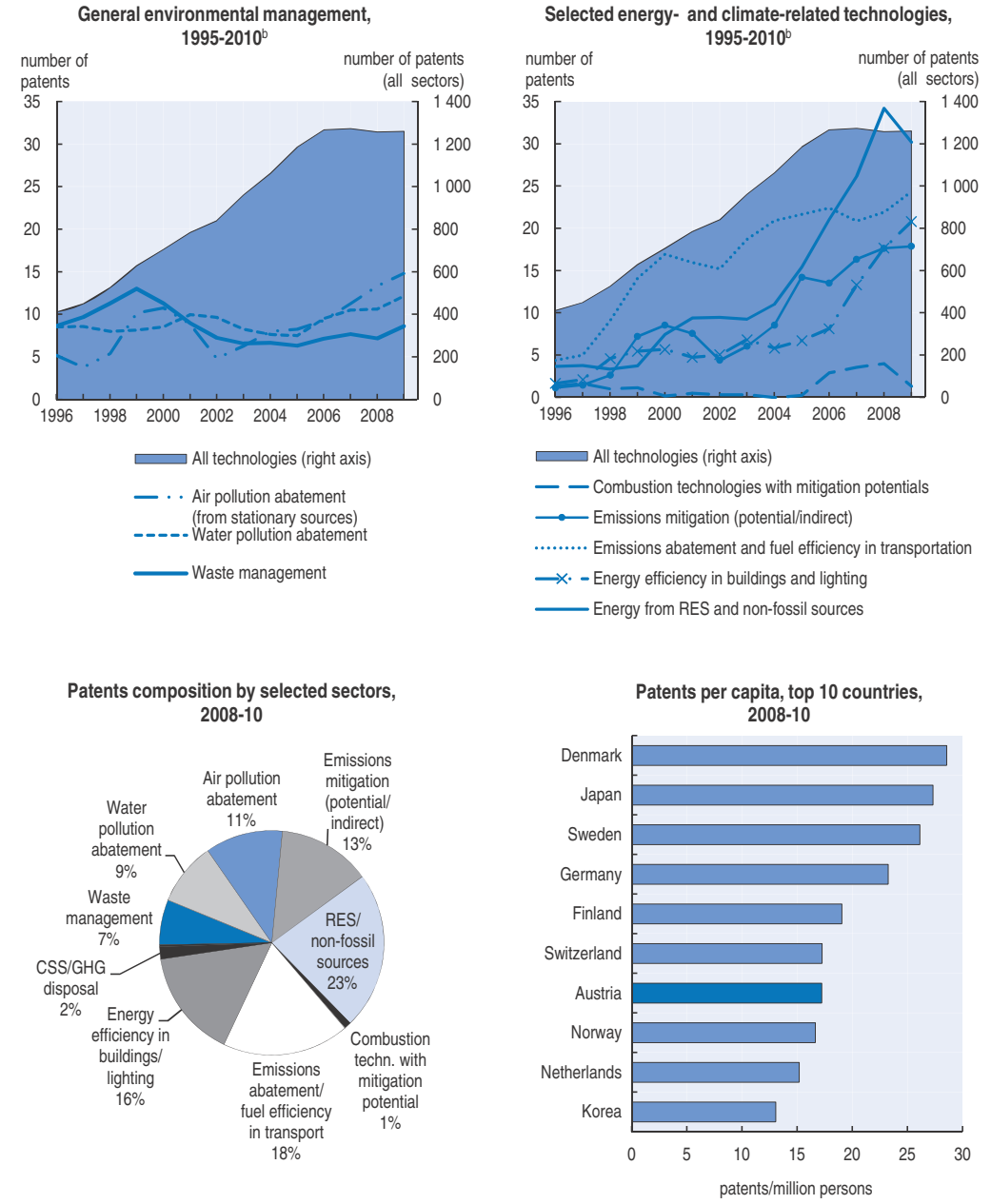
Austria has developed a comparative advantage in environmental technology (as measured by the revealed technology advantage), although it has lost ground in recent years (OECD, 2012d). Patent applications for environment- and climate-related technologies have continued to grow since 2000. As a small country, Austria does not account for a large share of OECD inventions in these fields. However, with an annual average of more than 17 patents filed under the PCT per million population in 2008-10, it ranked among the most innovative countries in environment- and climate-related technologies (Figure 3.8). Patents related to these technologies accounted for 11% of Austria's overall patents in the period.

Figure 3.8. **Patent applications[a] in environment- and climate-related technology**



a) Patent applications are based on the priority date and the inventor's country of residence, and use fractional counts on filings under the Patent Co-operation Treaty at international phase (European Patent Office designations).
b) Three-year moving average data.
Source: OECD (2013), *OECD Patent Statistics* (database).

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Since the late 1990s, patent applications in traditional environmental management (air, water and waste) have increased more slowly than those in other technological fields, including non-environmental technology (Figure 3.8). This phenomenon is common to many countries. The slowdown is particularly evident in solid waste management and in water/wastewater treatment and is partly due to the fact that these fields have reached a certain degree of maturity (OECD, 2011c).

By contrast, energy- and climate-related technologies have shown a higher innovation rate than the other technology fields overall. This is particularly evident as regards renewables, energy efficiency in buildings and emission abatement/fuel efficiency in transport. In 2008-10, renewables technology accounted for nearly a quarter of all innovations related to environment and climate change, followed by transport and energy efficiency in buildings (Figure 3.8). This trend, also common to many countries, is partly explained by increased demand for such technologies, especially in the EU as a consequence of the EU targets on renewables, energy efficiency and GHG emission reduction. In the case of Austria, other contributing factors include a high policy emphasis on reducing pollutant emissions from vehicles and, more recently, on electric mobility; extensive use of funding and incentive mechanisms for climate-related investment (Section 4); and, as noted above, increased public R&D funding.

7.2. The eco-innovation policy framework

General research, technology and innovation policy is formulated and implemented by the federal ministries of Science and Research; Transport, Innovation and Technology; and Economy, Family and Youth. The eco-innovation institutional framework also includes the BMLFUW. The institutional and policy framework for innovation, as well as for eco-innovation, is therefore characterised by a division between basic research, applied research and industrial policies, which are the responsibility of different ministries. This system, together with inadequate interministerial co-ordination, has often resulted in insufficient coherence or synergy between innovation and other policy areas (Federal Chancellery, 2011; Pirgmaier and Schreiber, 2011). In an effort to improve the innovation governance system, Austria launched a new research, technology and innovation strategy in 2011. It identifies climate change and scarcity of energy and material resources as key innovation policy priorities.

Among the strategic initiatives that specifically support eco-innovation is the Masterplan Environmental Technology, launched by the BMLFUW and the *Land* of Lower Austria in 2007. It prioritises export promotion; research and education; financing; and strengthening of the domestic market for environment technology. The plan focuses on a wide range of environmental technology fields, including water, waste, air and energy, while most other EU countries tend to prioritise climate change and clean energy technology (WIFO, 2009). The Climate and Energy Fund is a key instrument to implement the plan (Box 3.2).

The Austrian eco-innovation policy mix largely relies on supply-side measures, although less so than in many EU countries. Prevalence is given to R&D support, promotion of competence centres (e.g. Austrian Clean Technology) and eco-innovation clusters (e.g. Eco World Styria), education and training, and advisory and consulting services (Pirgmaier and Schreiber, 2011; WIFO, 2009). Demand-side instruments, including standards, labelling and green public procurement, have played an increasing role. For example, Lower Austria requests that newly constructed public buildings meet the advanced passive house standards. As already noted, the Environmental Support Act, the Climate and Energy Fund, klima:aktiv and the renewables feed-in tariff system have helped stimulate domestic demand for EGS. However, uptake of innovative environmental technologies has progressed slowly and the domestic market has remained relatively small (Pirgmaier and Schreiber, 2011). This suggests that Austrian companies have a preference for established technology and that funding for environment-related investment does not

sufficiently encourage investment in new technological solutions. The establishment of an environmental technology verification system at EU level could help overcome this obstacle. The Masterplan Environmental Technology includes among its objectives developing innovative public procurement mechanisms and targeted financing instruments, and "reinforcing the ecological components of the tax system", with a view to strengthening domestic demand for environmental technology.

Overall, Austria has implemented a wide-ranging set of policy measures to promote innovation in, and diffusion of, environment- and climate-related technologies. Indicators like patents per capita and contribution of the EGS sector to GDP suggest that these policies have been effective. However, some weaknesses remain, many of which are common to general innovation policy, while others are related to the risks inherent in developing new technologies in the environment sector. These weaknesses include the fragmented governance structure and the multiplicity and potential duplication of financing mechanisms. In addition, difficult access to subsidies is perceived as a major barrier to eco-innovation (EC, 2011b), particularly for small and medium-sized enterprises (SMEs), which are key drivers of innovation in the environmental technology sector. SMEs have more limited access to credit and venture capital than larger companies and may have trouble meeting the often high up-front costs of R&D. In addition, there is a need to build managerial and technical capacity of SMEs so as to facilitate their contacts with academic and scientific institutions and their access to knowledge and research outcomes.

8. Mainstreaming the environment in development co-operation

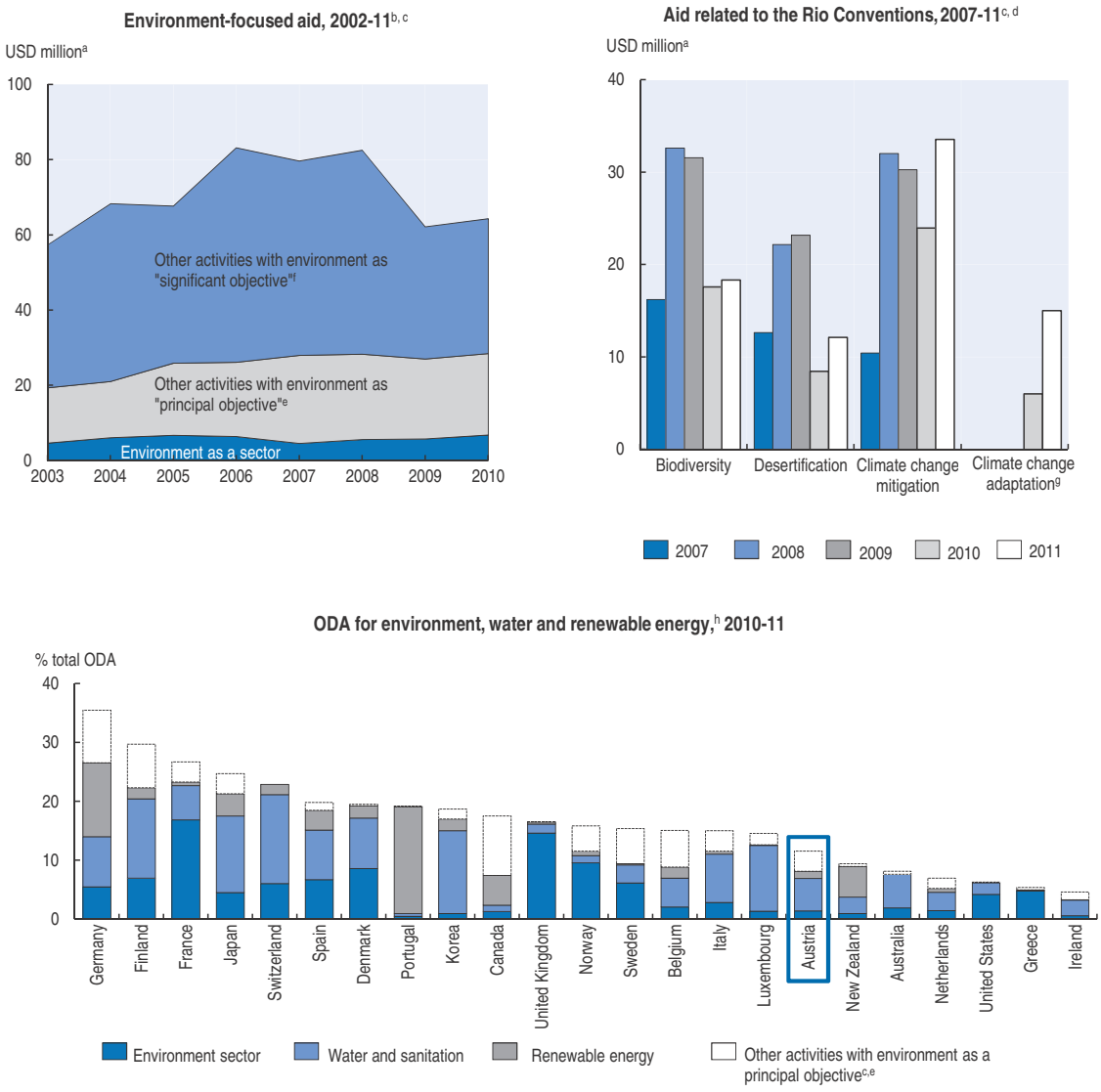
Planning and co-ordination of development co-operation policy are the responsibility of the Federal Ministry for European and International Affairs (BMEIA). The Austrian Development Agency (ADA) is responsible for implementing bilateral programmes and projects in partner countries, and manages a small part of the national official development assistance (ODA) flows. There is no consolidated ODA budget, and at least eight federal ministries and the *Länder* fund aid-related activities from their budgets. This makes the aid system fragmented and could undermine policy coherence (OECD, 2010).

As a small country, Austria accounts for relatively little of worldwide ODA. Its efforts focus on non-EU central and eastern European countries, partly for historical and proximity reasons, and least developed countries in sub-Saharan Africa. Austria's net ODA grew by nearly 70% in real terms between 2001 and 2007, but has since dropped significantly. In 2012, its net ODA was USD 1.11 billion, only slightly above the 2001 level. This is equivalent to 0.28% of gross national income (GNI), well below the EU intermediate target of 0.51% for 2010. Austria has reaffirmed its commitment to reach the international target of 0.7% ODA/GNI. However, it recognises that it will not be able to do so by the deadline of 2015 (set at EU level), due to domestic budget cuts that will run until 2014 (OECD, 2012e).

Austria has been increasingly committed to mainstreaming environment and climate in development co-operation. The 2003 Federal Development Co-operation Act indicates that "preserving the environment and protecting natural resources to ensure sustainable development" forms one of three key objectives of development co-operation (the others being reducing poverty and ensuring peace and security). In the context of declining ODA flows, bilateral aid for programmes in the environmental sector and/or with the environment as a core objective grew by 47% in real terms between 2002-04 and 2009-11

(annual average). Bilateral aid for activities with the environment as a significant, but secondary, objective followed the same trend as general ODA and declined markedly in the late 2000s (Figure 3.9).

Figure 3.9. **Bilateral aid in support of the environment**



a) Commitments of bilateral ODA expressed at 2011 prices and exchange rates.
b) The coverage ratio for activities screened against the environment policy marker is nearly 100% of total sectoral-allocable aid.
c) The marker data do not allow exact quantification of amounts allocated or spent in support of the environment. They give an indication of such aid flows and describe the extent to which donors address these objectives in their aid programmes.
d) Most activities targeting the objectives of the Rio Conventions fall under the definition of "environment-focused aid" but there is no exact match of the respective coverage. An activity can target the objectives of more than one of the conventions, thus respective ODA flows should not be added.
e) Activities where environment is an explicit objective of the activity and fundamental in its design.
f) Activities where environment is an important, but secondary, objective of the activity.
g) Climate change adaptation markers exist only since 2010.
h) Commitments of bilateral ODA expressed as percentage of total sector-allocable ODA.
Source: OECD (2013), *OECD International Development Statistics* (database); OECD calculations.

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Overall, in 2010-11, bilateral aid for environment-related programmes (i.e. for the environment as a sector, renewables, water and sanitation, and activities with fundamental environmental objectives) was equivalent to 11.5% of total sector-allocable ODA. This is low compared to many other members of the OECD Development Assistance Committee (Figure 3.9). Water and sanitation accounted for nearly 48% of environment-related aid, followed by other activities with environment as a principal objective (29%). Austria's commitments to the objectives of the Rio Conventions on climate change, desertification and biodiversity increased in 2008, then declined sharply. Only in 2011 did aid related to the conventions pick up again, especially in the areas of climate change and desertification (Figure 3.9). While climate change mitigation dominates, Austria bilateral aid has been increasingly focused on adaptation, which partly reflects increased political emphasis on this issue at home (Chapter 5).

In 2009, the BMEIA and the BMLFUW, in consultation with NGOs, approved the Strategic Guidelines on Environment and Development in Austrian Development Policy, which provide the reference framework for mainstreaming environmental objectives in development co-operation activity at federal level. The guidelines, which had been long overdue, are a step towards improving coherence among the development agendas of the various ministries. They include an analysis of environment-related challenges, set operating principles, outline a common implementation strategy and summarise planned activities of all involved ministries by means of an "implementation matrix". The guidelines identify four priority areas: achieving sustainable natural resource management, combating desertification and preserving biodiversity (e.g. promotion of organic farming and sustainable forest management); climate change (e.g. energy efficiency and renewables, adaptation); water and sanitation; and environmentally sound chemicals and waste management. However, staff and expertise for dealing with environment- and climate-related issues remain limited in Austria's development co-operation system, including in the BMEIA and ADA. Thus, setting fewer priorities could increase aid effectiveness, as the OECD (2010) recommended. It would be preferable for development co-operation priorities to match Austria's comparative advantage (e.g. adaptation, organic farming and renewables) and partner countries' needs.

As a cross-cutting theme, environment is treated as an integral component of development activities rather than in stand-alone programmes. Project screening is the main tool to ensure mainstreaming. All applicants for ADA funding (including NGOs and partner governments) must answer a set of environment-related questions. ADA then assesses environmental threats and opportunities of project proposals, as well as their relevance to the Rio Conventions. Environmental impact assessment is undertaken if ADA deems it necessary, which has been rare. Strategic environmental assessment has not been consistently undertaken for development policies and country programmes, and its use could be helpfully extended (OECD, 2010). A strategic evaluation of Austria's development co-operation in the environment and energy sectors is planned in 2014.

Notes

1. Between 2005 and 2008, a bonus applied to the vehicle purchase tax for diesel cars with particulate filters.
2. At the beginning of 2010, the share of Euro 0 to Euro III trucks in mileage on Austrian tolled roads was around 65%. It declined to 35% at the end of 2011. The share of lower-emission trucks grew from less than 1% to 16% in the same period (Withana et al., 2012).
3. The tax deductible amount can reach up to EUR 3 672 per year for distances beyond 60 km if public transport is considered inaccessible because it is available on less than half the distance between living and workplace or exceeds a certain commuting time threshold, or the person suffers from a severe walking impairment.
4. On average, funds under the act subsidised 17.6% of investment costs in 2011, compared with an annual average of 29% for 1993-2010. The subsidy rate for private investment supported through UFI also declined, from an average 19% of investment costs in 1993-2010 to 14% in 2011.
5. This is likely to be an underestimate, because it excludes other funds managed at federal levels and those provided by the *Länder*.
6. Environmental protection includes all purposeful activities directly aimed at the prevention, reduction and elimination of pollution or any other degradation of the environment resulting from production processes or the use of goods and services. Expenditure includes investment and current expenditure by all sectors of the economy: the public and business sectors, specialised producers and households.
7. Specialised producers are separately identified waste and wastewater departments of large municipalities and both private and public enterprises that have provision of environmental protection services as their main activity (mainly waste and wastewater management and water supply).
8. Expenditure by businesses is investment and current expenditure related to measures taken to treat or prevent pollution from the operating activity of a company. Expenditure by companies specialised in the provision of environmental services is excluded.
9. In general, extended producer responsibility programmes oblige producers to take care of, or financially support, the recycling, reuse and treatment of specific waste streams.
10. Subsidised investment in the water sector decreased from over EUR 1.5 billion in 2000 to about EUR 0.5 billion in 2011 (BMLFUW, 2011).
11. Energy-intensive users pay an annual flat rate of EUR 35 000.
12. EGS data produced by Statistik Austria are consistent with the Eurostat definition of the sector: production activities generating environmental products (i.e. those produced for the purpose of environmental protection or resource management). EGS fall within the following categories: environmental specific services, environmental sole purpose products (connected products), adapted goods and environmental technologies. The scope of the EGS sector is defined according to the classification of environmental protection activities and the classification of resource management activities.
13. For example, as part of klima:aktiv, 8 000 professionals such as plumbers, builders, planners, energy consultants and driving instructors have received training.

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PART II

Progress towards selected environmental objectives

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PART II

Chapter 4

Chemicals management

Austria has adopted a proactive approach to chemicals policy, both domestically and within the EU. This chapter examines Austria's policy and institutional framework for managing the risks associated with chemicals. It assesses the measures taken to implement the EU chemicals legislation, in particular the Regulation on Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH). The chapter provides an overview of the occurrence of some hazardous substance categories in human bodies and the environment, based on a range of monitoring programmes. Finally, Austria's endeavours to promote "green chemistry" and chemicals leasing are discussed.

Assessment and recommendations

Austria's management of the risks associated with chemicals takes place mainly in the framework of EU legislation and policies. It has generally been a proactive participant in the development of EU policy, and pioneered some initiatives that were adopted at EU level, e.g. the regulation of volatile organic compounds, fluorinated greenhouse gases and heavy metals. Most recently, Austria has been at the forefront of efforts to analyse and promote debate about managing the potential health and environmental risks associated with nanomaterials.

In 2007, the EU Regulation on Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) took effect and significantly altered the framework for chemicals management in Austria and the European Union. EU regulations on classification, labelling and packaging (CLP) and on biocidal products have also been significantly changed in recent years. REACH has fundamentally redefined chemicals management by shifting the burden of proof for the safety of chemicals from government to industry. Austria and other EU countries, together with the European Chemicals Agency, must now ensure that industry generates sufficient information on the health and environmental effects of chemicals and, when appropriate, require authorisation or restrictions on the use of specific chemicals.

While REACH will generate more information about chemical hazards, its implementation is still at an early stage and will involve much learning by doing. Monitoring the presence of chemicals in humans and the environment is one source of information about potential hazards but, even when such data are available, extrapolating health and environmental impacts is very difficult. Austria has launched many initiatives to identify priority chemicals, but the human and financial resources are very limited in relation to the objectives to be achieved. Continued efforts are, therefore, needed to enhance the efficiency and effectiveness of current initiatives. Steps that could be taken include developing performance indicators that can guide risk reduction activities and help monitor progress; seeking efficiency gains, e.g. by better integrating activities related to biocides and plant protection products; and linking scientific and monitoring programmes more closely with decision making regarding risk reduction.

The development and implementation of chemicals legislation enjoys broad support within the Austrian government and with the main stakeholders. Horizontal and vertical inter-institutional co-operation is smooth and the division of duties is clear. Building on a long-established tradition, co-operation between industry and government is particularly strong. Several forums and platforms have been established to facilitate dialogue. Government and industry work closely in supporting the REACH Helpdesk, and have jointly developed guidance documents. The development of the Nanotechnology Action Plan was based on close co-operation between industry and government, as well as with other stakeholders. However, meeting the requirements of REACH will be a major challenge for chemical companies, especially small and medium-sized enterprises (SMEs). More could

be done to target support to SMEs, particularly those that produce or use very hazardous chemicals, and to further streamline administrative requirements.

EU countries must prepare dossiers for chemical substances that might be considered candidates for authorisation. Those confirmed can only be marketed subject to the terms of the authorisation. Inclusion on the candidate list triggers obligations on industry to provide further information. Austria has been one of the most active countries in identifying candidate chemicals for authorisation; since 2008, it has prepared dossiers on nine substances, and it set the objective of nominating two to three substances a year for inclusion on the candidate list. To identify candidate chemicals, it uses a risk-based approach, drawing on monitoring data. The approach adopted seems well founded and could serve as a model for other countries.

Enforcement of REACH and the CLP in Austria rests with the nine *Länder*. There are a total of about 25 chemicals inspectors, whose responsibilities have increased with the implementation of REACH. Training, planning, provision of guidance and co-ordination appear to be well organised. Co-operation with health and safety inspectors has been established, and co-operation with inspectors responsible for water management is to start in 2013. This kind of arrangement could be usefully extended to other environment- and chemicals-related areas. In addition, further efforts could be made to develop indicators linking the performance of inspectors with the reduction of chemicals-related risks. More stringent penalties for non-compliance may need to be applied as experience with REACH develops; currently enforcement actions are generally limited to requests to comply with requirements.

Austria established a pollutant release and transfer register (PRTR) in 2007, one of the last EU countries to do so. The PRTR now meets or exceeds all EU reporting requirements. There is some evidence that it has provided support at the policy level, but more could be done to enhance its transparency and user-friendliness and to make it more accessible to the public.

A 2008 assessment of Seveso Directive implementation concluded that while the provision of information by industry to the public on preparedness for, and response to, major accidents had improved significantly, along with overall safety levels, operators and public authorities should be more proactive. The land-use planning implications of major accident hazards should also be taken into account in the regulatory process, though this is complicated by jurisdictional issues.

One objective of REACH is to enhance the competitiveness of the EU chemicals industry, in particular by providing better incentives to develop safer alternatives to hazardous chemicals. Austria has supported this goal by establishing platforms for the exchange of information among stakeholders on "green chemistry" and on substitutes for hazardous chemicals. Together with Germany and the EU, Austria developed these platforms into a portal providing a worldwide overview of chemicals substitution. Austria has also pioneered chemicals leasing, in which suppliers provide chemicals for certain functions, but retain ownership and take them back when end users no longer need them. Studies suggest that wider use of chemicals leasing could yield significant economic and environmental benefits. Further analysis should be conducted to examine the obstacles to achieving this potential and how they could be overcome.

Recommendations

- Continue to play an active and leadership role in the implementation of REACH and in the work of the European Chemicals Agency.
- Consider how the overall efficiency and effectiveness of chemicals management could be enhanced, for example by developing performance indicators to help guide and monitor the implementation of chemicals control measures and by linking scientific and monitoring programmes more closely with decision making regarding risk reduction.
- Develop a coherent, integrated approach to chemicals and waste management; strengthen co-operation between the programmes on biocide and plant protection products, e.g. in the fields of hazard assessment, authorisation procedures and occupational exposure.
- Strengthen capacity for promoting compliance with chemicals legislation in the *Länder*; strengthen co-operation among inspection bodies in areas such as chemicals, consumer and worker protection, waste, chemical installations, and land-use planning; develop an enforcement strategy to achieve compliance of biocidal products with the EU Biocides Directive.
- Provide more targeted support to SMEs for compliance with REACH requirements, particularly for companies that produce or use very hazardous chemicals.
- Facilitate greater public access to, and use of, the PRTR by improving its transparency and user-friendliness.
- Assess the implementation of the Nanotechnology Action Plan and specify additional measures that may be needed to achieve its objectives.
- Continue to promote chemicals leasing and examine the barriers to its wider application.

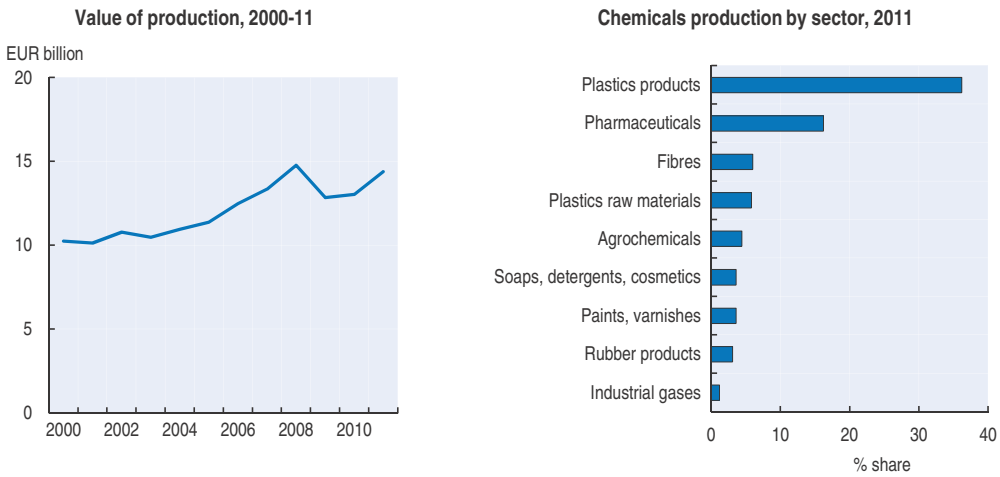
1. The chemicals industry in Austria

The chemicals industry is the second largest industrial sector in Austria, representing about 10% of industrial production value and 12% of value added in 2011 (ABA, 2011). In 2011, the sector accounted for about 10% of total Austrian industrial employment, 13.5% of R&D expenditure and 17% of industrial spending on environmental protection.

In 2011, the value of chemicals production was EUR 14.4 million, a 10.5% increase over 2010, evidence of a recovery following the global financial crisis (Figure 4.1). In the past decade, the sector's output has grown by 42% overall. More than two-thirds of the chemicals produced in Austria are exported.[1] The value of both import and export of chemicals has grown over the past seven years.[2] In 2011, 85% of imports originated in European countries and almost 83% of exports were sold to countries in the same region. Many Austrian chemical companies have foreign subsidiaries or act as headquarters in central and Eastern Europe for multinational chemical companies. Activities in the newer EU countries are an important factor in the recent growth of the Austrian chemicals industry.[3]

The chemicals sector comprised 273 companies in 2011 (down from 349 in 2001) and employed nearly 44 000 people, about 400 more than 10 years before. It is made up of primarily mid-sized companies employing, on average, about 145 people; only 17 companies have more than 500 employees. Chemicals companies are distributed across Austria, with key clusters in Upper Austria near Linz and in the Vienna region.

Figure 4.1. **Chemicals production**



Source: Association of the Austrian Chemical Industry (FCIO), 2012.

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Plastics (raw materials and products) made up more than 40% of the value of chemicals production in 2011, followed by pharmaceuticals (16.2%). Agrochemicals represented 4.4% (Figure 4.1). Over the last ten years, investment in the chemicals industry has varied widely, with both positive and negative swings. It peaked in 2007, before the global economic crisis, but today is still 11% higher than it was ten years ago (WIFO, 2012).

2. Policy-making framework

Although Austria did not join the European Union until 1995, it had already adapted its chemicals legislation to EU requirements. In some cases, bans and restrictions on hazardous substances in Austria, e.g. on ozone-depleting substances and volatile organic compounds, were more stringent than those then in effect in the EU (Box 4.1). At the beginning of the 2000s, Austria's management of chemicals took place in the framework of various EU directives dating from the 1970s, such as the Dangerous Substance Directive

Box 4.1. **Austria's example in restricting volatile organic compounds**

Volatile organic compounds (VOCs) are emitted as gases from certain solids or liquids. VOCs include a variety of chemicals, some of which may have short- and long-term adverse health effects. Concentrations of many VOCs are consistently higher indoors (up to ten times higher) than outdoors. VOCs are emitted by thousands of products, including paints and lacquers, paint strippers, cleaning supplies, pesticides, building materials and furnishings, office equipment such as copiers and printers, correction fluids and carbonless copy paper, graphics and crafts materials such as glues and adhesives, permanent markers, and photographic solutions.

In 1995, Austria was the first EU country to restrict VOCs, thus providing a risk management model for EU-wide VOCs regulation. Directive 1999/13/EC regulates emissions of VOCs due to the use of organic solvents in certain activities and installations (VOC Solvents Emissions Directive). Today, to comply with EU legislation, Austria annually monitors 150 to 200 product samples from paints and varnishes for VOCs.

(1967/548/EEC), the Dangerous Preparations Directive (1999/45/EC) and the Existing Substances Regulation (1993/793/EEC). Austria established its own national system for registration of substances, and set control and enforcement measures to ensure the functioning of the system.

2.1. Key EU regulations on chemicals and biocides

During the 2000s, the European Union concluded that the legislative framework on chemicals was insufficient to protect human health and the environment from chemicals (Box 4.2). Following lengthy negotiations, the Regulation on Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) was adopted; it came into force on 1 June 2007. Together with the Regulation on Classification, Labelling and Packaging of substances and mixtures (CLP) and the Biocidal Products Regulation (BPR), REACH provides the essential framework for management of the health and environmental risks associated with chemicals.[4] The recently amended Federal Chemicals Act transposes the main elements of EU chemicals policies into Austrian law, specifying that the Ministry of Agriculture, Forestry, Environment and Water Management (BMLFUW) is the leading co-ordinating authority in this policy area (Section 3).[5]

Box 4.2. **How the new EU chemicals policy developed**

Before REACH, the EU legislative framework on chemicals had evolved piecemeal over time and was a patchwork of directives and regulations. By the early 2000s, EU countries had concluded that it did not provide a sufficient basis for protecting people and the environment from the potentially adverse effects of chemicals.

The old system distinguished between "new" and "existing" chemicals, with a cut-off date of 1981. Chemicals marketed after that – new chemicals – had to be reported to the authorities, and those produced in quantities above 10 kg per year were subject to test requirements. There were no requirements on the 100 000 or so existing chemicals, those on the market before 1981. Although some data on the properties of existing chemicals were available, they were considered insufficient for adequate assessment and control of the substances. Among other things, this discouraged research and innovation in new chemicals in favour of further development of existing ones.

Public authorities rather than companies were responsible for risk assessment of substances. Risk assessment was comprehensive rather than targeted and use specific, and relatively few existing chemicals were subject to it. As a result, there were very few restrictions on the marketing and use of chemical substances on the grounds of health or environmental protection, and the process for imposing such restrictions was slow.

Only manufacturers and importers, moreover, were required to provide safety information about chemicals; downstream users, such as industrial users and formulators, were generally not subject to the same obligation. Thus information on whether downstream uses were appropriate was scarce.

Source: EC (2007).

The objective of REACH is to improve the protection of human health and the environment from the risks that can be posed by chemicals, while enhancing the competitiveness of the EU chemicals industry. It also promotes alternative methods of hazard assessment in order to reduce testing on animals.

REACH shifted the burden of proof regarding the safety of chemicals from government to companies under the "no data, no market" principle. To comply with the regulation, companies must identify and manage the risks linked to the substances they manufacture and market in the EU. They have to demonstrate how the substance can be safely used, and they must communicate risk management measures to users. If the risks cannot be managed, authorities can restrict the use of substances in various ways. In the long run, the most hazardous substances should be replaced by less dangerous ones (Box 4.3).

Box 4.3. **The REACH process**

REACH establishes procedures for collecting and assessing information on chemicals' properties and hazards. Companies need to register substances, working together with other companies that are registering the same substance. Companies must provide information on the physicochemical, health and environmental properties of substances with a view to determining how substances can be used safely.

The European Chemicals Agency (ECHA) receives registrations and evaluates their compliance; individual countries evaluate selected substances to clarify any initial concerns for human health or the environment. Evaluation under REACH focuses on three areas: examination of testing proposals submitted by registrants, compliance checking of the dossiers submitted and evaluation of substances. ECHA evaluates each dossier to assess the testing proposals, checking whether the dossier complies with requirements. ECHA also co-ordinates substance evaluation, which countries carry out to investigate chemicals of concern in more depth.

The authorisation procedure aims to make sure that the risks from substances of very high concern (SVHCs) are properly controlled and that these substances are progressively replaced by suitable alternatives while ensuring the good functioning of the EU internal market. Substances with certain hazardous properties (e.g. carcinogens) may be identified as SVHCs. After a two-step regulatory process, SVHCs may be included in the candidate list of substances requiring authorisation, meaning they cannot be placed on the market or used unless authorisation is granted for a specific use, or the use is exempted from authorisation. Companies applying for authorisation have to demonstrate that the risk associated with use of the substance is adequately controlled or that the socio-economic benefit of the use outweighs the risk.

A further step is restriction, a tool to protect human health and the environment from unacceptable risks posed by chemicals. Restrictions may limit or ban the manufacture, marketing or use of a substance. They can apply to the substance on its own, or in mixtures or articles even if those do not require registration. It can also apply to imports. An individual country – or ECHA, on request of the European Commission – can propose restrictions if it finds that the risk associated with a substance need to be addressed on an EU-wide basis.

Source: ECHA (2013).

Since this legislation has only been in force for five years and is being implemented in stages, it is not yet possible to assess the efficiency and effectiveness of its implementation. The benefits of the REACH system are expected to manifest themselves gradually, as more and more substances are subject to its requirements. The regulation imposes 2010, 2013 and 2018 deadlines for registration by industry, based on tonnage and classification of substances.

EU countries are also required to implement the CLP Regulation, which entered into force in 2009 and has a transition period running until 2015. The CLP requires industry to classify and label chemicals so as to clearly communicate hazards they present to workers and consumers in the European Union. Before placing chemical substances and mixtures on the market, industry must establish their potential risks to human health and the environment, classifying them according to the hazards identified. Hazardous chemicals also have to be labelled according to a standardised system so that workers and consumers know about their effects before they handle them. The hazards are communicated through standard statements and pictograms on labels and safety data sheets. The CLP, which is based on the United Nations Globally Harmonised System, replaces two previous pieces of legislation.

The BPR concerns the marketing and use of biocides – products containing active substances that are used to protect humans, animals, materials or articles against harmful organisms, such as pests and bacteria. Approved in 2012, it is applicable from 1 September 2013, with a transitional period for certain provisions. All biocides to be placed on the market require authorisation, and the active substances they contain must be previously approved. The BPR is intended to harmonise the market at European Union level, simplify the authorisation and approval of active substances and introduce timelines for countries to evaluate substances, form opinions and make decisions. It also promotes reduction of animal testing by making data sharing mandatory and encouraging the use of alternative testing methods.

2.2. Other legislation related to chemicals

Chemical hazards are also managed within several other EU legal frameworks, such as legislation on fluorinated gases. Implementation of the Seveso Directive for the prevention of, preparedness for and response to chemical accidents in hazardous installations is provided for in an ordinance on the information to be provided by operators of establishments with a major accident risk.[6] The public that might be affected has to be informed about safety measures and what to do in case of an accident. Austria goes beyond the provisions of the directive, requiring this information to be supplied also by operators of lower-tier establishments, such as commercial installations (Section 9).

Under the 2003 UNECE protocol on pollutant release and transfer registers (PRTRs), the European Union has to establish an EU-wide PRTR comprising data from all EU countries' national registers.[7] In Austria, a publicly accessible online PRTR was established in 2007. It takes into account obligations under the UNECE protocol that go beyond the EU regulation (Section 8).[8]

Chemicals are also regulated through several multilateral environmental agreements, including the Stockholm Convention on Persistent Organic Pollutants, the Rotterdam Convention on Prior Informed Consent for certain hazardous chemicals and pesticides in international trade, and the Montreal Protocol on ozone-depleting substances.

3. The institutional setting for chemicals management

The authority charged with implementing legislation on the management of biocides and other chemicals is the BMLFUW. The Ministry of Economy, Family and Youth (BMWFJ) is responsible for legislation related to chemical accidents. Other ministries with partial or co-ordinating responsibility include the Ministry of Health, whose Food Safety Agency

co-ordinates with the BMLFUW on the safety of active ingredients in pesticides. The customs authorities are involved in enforcement of chemicals legislation.

The overall objective of the BMLFUW work on chemicals is to manage the tasks under REACH and the CLP and to ensure that Austria plays an active role in the EU chemicals management system. The ministry's work on chemicals management is co-ordinated through its chemicals and biocides directorates, where 27 people work in units covering REACH and the CLP, biocides and pesticides authorisation, detergents, restrictions on specific chemicals (e.g. fluorinated gases, solvents) and implementation of UN conventions and instruments. A planned merger of the biocides and chemicals units should increase efficiency and effectiveness. Recently the chemicals policy directorate was merged with the general directorate responsible for waste management issues to strengthen co-ordination between those two areas. The BMLFUW is also working to strengthen the policy links between waste management and chemicals.[9]

The ministry is supported by Environment Agency Austria, which manages the REACH Helpdesk, serves as Austria's access point to the central online reporting system (REACH-IT) and advises enforcement authorities and the ministry on REACH and CLP procedures, such as evaluation, authorisation, restriction, classification and labelling. The agency also designs and executes monitoring programmes, and hosts laboratories which carry out analytical work, such as sample analysis. Its chemicals and biocides unit employs 25 people.

Co-operation between the BMLFUW and other institutions is organised through an informal forum called the Austrian REACH platform. Participants include the *Land* enforcement authorities; the BMWFJ; the Ministry of Labour, Social Affairs and Consumer Protection (BMASK); the Ministry of Finance; the social partners; and non-government organisations (NGOs).

As in other areas, the public authorities and industry work closely together in the development and implementation of legislation. This builds on a long tradition of co-operation with the private sector, known as the *Sozialpartnerschaft* (Chapter 2). Overall, Austria's way of managing chemicals has met with broad public support. All stakeholder groups, including environmental NGOs, are involved in implementation and are generally satisfied with the progress to date.

The chemicals industry professional federation is the Austrian Chemicals Industry Association (FCIO), which is part of the Austrian Economic Chamber (WKÖ). As the chamber has a traditional right to participate in government decision making, there is close co-operation between industry and government in the development of legislation at the national, EU and even international levels.

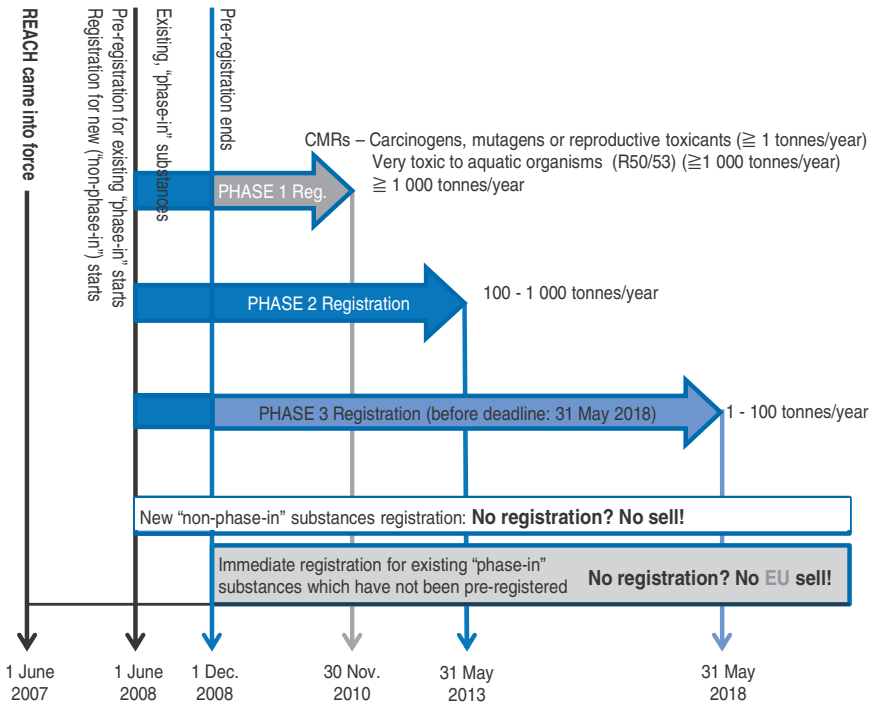
4. Implementation of the REACH and CLP regulations

4.1. *Registration*

REACH requires chemical companies to submit data to ECHA on substances' characteristics and properties, according to a schedule based on import and production tonnages and toxicity criteria, e.g. carcinogenicity (Figure 4.2).[10] Meeting the REACH and CLP deadlines is a significant challenge for all stakeholders, but particularly for small and medium-sized enterprises (SMEs) in the chemical industry as well as in chemical-using sectors (e.g. automotive, painting) that must comply with the regulations for certain product groups. For SMEs, which make up 90% of the firms subject to registration

requirements, compliance with REACH is more difficult and costly than for large firms. An assessment of the potential impact of REACH commissioned by the environment and economy ministries, the WKÖ and the Chamber for Worker Protection in 2005 estimated that whereas large companies would spend less than 2% of annual turnover on REACH implementation costs, the proportion for SMEs would be close to 8% (DENKSTAAT et al., 2005).

Figure 4.2. **REACH: Schedule for chemicals registration**



Source: Adapted from REACH Only Representative website (*www.reachor.com*).

Government and industry have established a strong, open working relationship to address the challenges involved in implementing REACH and to ensure that companies receive appropriate information. The FCIO and WKÖ, with active support from the economy and environment ministries, have organised national and state-level conferences and workshops regarding CLP and REACH. The government has supported development of guidance documents targeting SMEs. The BMLFUW and Environment Agency Austria also work with industry through the WKÖ to assist firms, especially SMEs, in implementing EU legislation.

There is also close co-operation between government and industry on the content and communication policy of the REACH Helpdesk.[11] Not only does the helpdesk provide advice about how to comply with REACH and CLP obligations, but it also provides information to consumers on high-concern substances in purchased products. A study by the European Consumers' Organisation concluded that the response of Austrian companies to consumer requests was high compared with most other EU countries, but

that, nevertheless, responsibilities along the supply chain to provide information to consumers remained for the most part unclear throughout the EU and that improvements were necessary (Mauer, 2012).

Despite the various government-industry initiatives, further support to industry, particularly SMEs, is needed to ensure that the 2013 and 2018 registration deadlines are met. Further efforts should be made to streamline the administrative burden of regulations and compliance monitoring on SMEs. Compliance promotion approaches more tailored to the needs in specific sectors could be developed (Mazur, 2012). The BMLFUW plans to work with the Labour Inspectorate in the BMASK to notify SMEs of their 2013 registration obligations, which would also be helpful in this regard.

4.2. Authorisation

Regarding substances of very high concern, EU countries must prepare dossiers (Annex XV dossiers) on the risks that specific SVHCs present so that it can be determined whether these substances should be put on the candidate list of substances requiring authorisation.[12] Inclusion of a substance on the candidate list triggers further REACH obligations for manufacturers, importers and users of the substance. Since 2008, Austria has prepared dossiers on nine substances, which makes it one of the most active EU countries in this respect.[13] It spends about EUR 50 000 per year on substance identification and candidate dossier preparation.

In the 2012 Federal Chemicals Act, Austria set a long-term objective of nominating two to three substances per year for inclusion on the candidate list, some in collaboration with Belgium, Poland or Germany. Environment Agency Austria has developed a procedure for selecting candidate substances using data gathered through scientific monitoring programmes on levels of SVHCs in humans and the environment, including data on exposure at the workplace. Initially the focus is on substances known to be carcinogenic, mutagenic or toxic to the reproductive system, followed by those which are persistent, bioaccumulative and toxic, then on potential SVHCs which have not been classified in these categories, such as endocrine disrupters and sensitisers. The final decision to nominate a substance – or to submit authorisation and restriction dossiers as a result of substance evaluation – is a political decision based not only on health and environmental criteria but also on considerations such as the availability and cost of substitutes. The decision involves several ministries.[14]

4.3. International co-operation in implementing REACH and CLP

Experience with the EU risk reduction instruments of authorisation and restriction, and in particular with the evaluation process under REACH, is still limited and evolving. Austria, like other EU countries, is still learning by doing. Experience of direct collaboration among countries under REACH and CLP is generally limited. Nevertheless, Austria has set an example by co-operating with other countries on issues such as authorisation policy and development of guidance for chemicals in articles such as clothing and packaging.

Given the complexity of the REACH and CLP requirements, successful implementation requires good co-operation, co-ordination and exchange of information not only between national authorities but also with the European Commission and ECHA. The latter plays an important role in communication by providing platforms for authorities dealing with specific aspects of REACH and CLP through its management board (chaired by Austria from

2008 to 2012), committees (Member States Committee, Committee for Socio-Economic Analysis, Committee for Risk Assessment), meetings of competent authorities and a forum for national enforcement authorities.

Table 4.1 shows that Austria participates actively in EU activities related to implementation of the regulations on chemicals. Despite resource constraints, on a per capita basis Austria has put more substances through these systems (via nominations to the candidate list, substance evaluations, dossiers for harmonised classification and labelling, rapporteurships, etc.) than any other EU country since 2007.

Table 4.1. **Austrian participation in ECHA activities related to REACH and CLP in 2007-11**

Description of activity	Indicators
REACH-IT access received (date)	31 May 2010
Participation in HelpNet meetings	Austria attended 12 out of 13 meetings
Number of HelpEx questions posted by Austria[a]	14
Number of comments posted by Austria on HelpEx questions	160
Participation in partner expert groups	Austria attended 13 out of 21 meetings
Participation in forum meetings	Austria attended all 12 meetings
Participation in forum working groups	Austria attended 5 out of 8 meetings
Austrian activity in REACH Information Portal for Enforcement (logins or equivalent)	168
Activity in Risk Communication Network (RCN)	Austrian REACH & CLP representatives attended 5 meetings in 2008-11[b]
Austrian activity in the Instrument for Pre-Accession Assistance Project	None
Participation in Member State Committee meetings	Austria attended all 23 meetings
Member State Committee rapporteur activity by Austria	None
Participation in Risk Assessment Committee meetings	Austria attended 17 out of 20 meetings
Risk Assessment Committee rapporteur activity	Austria served as rapporteur or co-rapporteur for 11 out of 187 meetings
Number of Risk Assessment Committee members appointed by Austria	4
Participation in Committee for Socio-Economic Analysis meetings	Austria attended all 14 meetings
Committee for Socio-Economic Analysis rapporteur activity	Austria served as rapporteur or co-rapporteur for 2 meetings
Number of Committee for Socio-Economic Analysis members appointed by Austria	4
Registrations submitted by Austria (dossiers)	496
Classification & labelling notifications submitted by Austria (dossiers)	2 664
Notifications submitted by Austria of substances in articles	21
Downstream user reports submitted by Austria	2
Austrian participation in the expert group on persistent, bioaccumulative and toxic properties of chemicals	Yes
Austrian participation in Exchange Network on Exposure Scenarios	Yes
Preparation of harmonised classification & labelling dossiers	Austria prepared 43 out of 175 dossiers submitted
Preparation of SVHC dossiers	Austria prepared 6 out of 90 dossiers submitted
Number of substances proposed by Austria for evaluation in the Community Rolling Action Plan	Austria prepared all 3 dossiers
Austria's proposals for amendments to REACH	None

a) HelpEx is a secure web-based discussion platform which allows ECHA HelpNet members to discuss difficult questions.
b) RCN activities were suspended in 2012 after resource constrains led to shifts in ECHA activity priorities.
Source: ECHA.

4.4. Enforcement of REACH and CLP

Enforcement of REACH and CLP is a national responsibility. Each EU country must ensure that it has an appropriate framework of penalties that is effective, proportionate and creates incentives for compliance. Enforcement generally involves a range of actions

that national authorities initiate to verify duty holders' compliance with the REACH and CLP regulations. Responsibilities include checking whether substances have been registered or pre-registered and verifying the availability and accuracy of safety data sheets.

Monitoring activities cover producers, importers, wholesale and retail distributors, and downstream users. The CLP does not fundamentally change the legislative system that has been in force for many years, but enforcement must now deal with both the current system and the transition to the new system. Although the new system came into force in 2012, the transitional period will last for several years.

In Austria, environmental legislation is implemented by the nine *Länder*, which apply and enforce federal law through inspectorates. Controls are carried out by the 25 *Land* inspectors, based on guidance and training provided by Environment Agency Austria. The number of chemicals inspectors has not changed following the implementation of REACH, implying that inspectors' responsibilities have increased. Inspection plans are prepared by the inspectorates and co-ordinated with the BMLFUW to ensure that REACH obligations are enforced as comprehensively as possible. Special issues (companies, branches, products) are regularly selected as a focus for enforcement authorities. The chemicals inspectorates report to the BMLFUW on their activities and meet for training and co-ordination twice a year to ensure good planning and co-ordination of inspection activities, not only for REACH but also for other regulations and directives, such as those on VOCs, persistent organic pollutants (POPs), ozone-depleting substances, fluorinated gases and biocides.

Since 2010, enforcement officers from the *Land* chemicals inspectorates have co-operated with officers responsible for enforcing occupational health legislation regarding use of chemicals in the workplace. Austria plans to establish similar enforcement co-operation agreements between the chemicals inspectorates and the authorities responsible for enforcing provisions on water protection, beginning with joint seminars and workshops.

Many chemicals inspectors have other duties besides enforcing chemicals legislation, so the effective capacity is less than the number of inspectors implies. Nevertheless, between 2007 and 2009, 630 REACH inspections were performed in Austria: on-site controls, sampling, review of documentation, etc. Some 57% of the inspections entailed verifying that information was available throughout the supply chain. Sanctions for non-compliance and breaches of registration and authorisation requirements have been codified in a multiphase system that includes administrative sanctions (fines) and criminal penalties for REACH infringement. The enforcement measures most often applied to date have been coercive, rather than punitive, and involve asking the offender to comply with legal requirements (Milieu, 2010). More stringent penalties for non-compliance may need to be applied as experience with REACH develops.

ECHA has no enforcement responsibilities since it is an EU-level institution, but it hosts the Forum for Exchange of Information on Enforcement, composed of representatives of national enforcement authorities. The forum facilitates exchange of information and co-ordination of enforcement activities related to REACH and CLP. Austria has been very active in the forum and puts a high priority on EU-wide projects developed through it.[15]

5. Biocidal products

A specific legal framework was designed in Austria to implement the EU legislation on biocides. Authorisation procedures for marketing of biocides began in 2010. For all biocidal products, Austrian chemical legislation applies, under the authority of the BMLFUW. An assessment of compliance with EU directives on biocides conducted by the Chemical Legislation European Enforcement Network (CLEEN) indicated that Austria is one of the five EU countries with the most non-compliant products (Box 4.4).

Box 4.4. **CLEEN: Network on enforcement of biocide legislation**

Austria takes part in the informal Chemical Legislation European Enforcement Network, which co-ordinates and improves enforcement of EU chemicals and biocides legislation. Under the auspices of CLEEN, chemical inspectors of the EU Member States and other European countries set priorities for joint enforcement projects to facilitate information exchange and prepare recommendations to the European Commission regarding enforcement of REACH. The CLEEN EuroBiocides project started in 2005 with the aim to provide insights into the extent to which industry complies with the requirements of the 1998 Biocidal Products Directive, along with the enforceability of the directive. The final report, published in May 2011, showed that in Austria and four other countries (Norway, Denmark, Belgium and Finland) the number of products not in compliance was between 10% and 50% higher than in other countries. The report recommended that governments:

- raise public awareness of existing problems and highlight the need for public information and general monitoring of issues related to biocides.
- inform downstream users, professionals, retailers and wholesalers about legislation, status of active substances and any other biocide issues.
- support enforcement strategies and produce information which can reduce the number of products not in compliance with the directive.

Source: CLEEN (2011).

Plant protection products and biocides will have very similar authorisation procedures once the BPR enters into force in September 2013 (Section 2.1). Hazard assessment of the active substances in biocides and plant protection products – which are often the same – is carried out in the same way, using the procedures developed for plant protection products. Assessment of occupational exposure is also similar. The same maximum residue levels apply if a biocide is used in a plant protection product.[16] Risk assessment of biocides differs, depending on which of the 23 product groups they fall into, but has many similarities to that for ecotoxicological assessment of plant protection products. As there are many similarities in the testing requirements, the expertise needed to interpret their results is largely the same. Recently, a number of dossiers for harmonised classification and labelling were submitted for biocides and plant protection products. A long-term target is for Austria to submit two such dossiers per year. As Austria begins implementing the biocides regulation, the coherence and efficiency of the biocide and plant production product management programme would be enhanced by increased co-operation, e.g. on hazard assessment, authorisation procedures and occupational exposure assessment.

6. Nanomaterials

A debate on regulation of nanomaterials was initiated in Austria in 2006. An initial parliamentary inquiry was made in 2007. The same year, the Bioethics Commission at the Federal Chancellery adopted a recommendation on nanotechnology. In 2008, the debate gained momentum with several conferences. In 2010, the Nanotechnology Action Plan was adopted. The government is now discussing a regulation for nanotechnology, which would also deal with the safety of nanomaterials.

The Nanotechnology Action Plan focuses on the advantages and risks of nanomaterials, as well as on co-operation and information exchange (BMLFUW, 2009). It presents 50 recommendations in the fields of environment, health and safety, recommending that they be implemented by 2012 (Box 4.5). Further actions may be proposed on the basis of experience gained. It is important for the many measures in the plan to receive appropriate, and appropriately funded, follow-up in coming years.

The action plan was developed through an extensive consultative process involving a wide range of stakeholders and five ministries, co-ordinated by the BMLFUW.[17] This process is generally considered within Austria to provide a good model of how to develop a consensus on addressing a controversial, science-based policy issue (OECD, 2012). In the follow-up process, a continuous dialogue with experts from German-speaking neighbour countries (Germany, Liechtenstein, Switzerland) has been established. Called Nanodialogue, it is intended to establish a benchmarking system for policy approaches to nanomaterials.[18]

Box 4.5. **Key measures in the Nanotechnology Action Plan**

The action plan presents 50 recommendations for action at national, EU and international level. Based on a consensus among stakeholders, it aims to provide a strategic framework for the governance of nanotechnology and nanomaterials and to co-ordinate the various Austrian activities in the field. Key recommendations include:

- establishing a nanotechnology information platform to facilitate dialogue among experts from a wide variety of fields, along with other stakeholders and the public.
- communicating issues in language the public can understand and strengthening co-operation with the media using existing structures and best practices.
- reviewing the legal framework with a view to ensuring a high level of protection for the environment and human health, and providing a basis for formulating the Austrian position in EU and other international discussions.
- strengthening research, including co-operation between government and industry and international co-operation.
- addressing issues such as funding that might impede further development of nanotechnology companies, including SMEs.
- further developing capacity to address potential health, environmental and safety issues associated with nanomaterials.

Source: BMLFUW (2009).

7. Monitoring of hazardous substances

Austria has many programmes for monitoring hazardous chemicals. The context for the monitoring varies and takes account of EU requirements (e.g. the Water Framework Directive) and the need to provide a scientific basis for the selection of chemicals as candidates for authorisation or restriction under REACH. However, there is a large number of monitoring programmes, which makes planning and co-ordination a challenge. It also weakens the contribution of monitoring to decision making.

7.1. Endocrine-disrupting substances and phthalates

In response to growing public concern, monitoring of suspected endocrine-disrupting chemicals, such as bisphenol A and some phthalates used in plastics, began in Austria about ten years ago. A project completed in 2003 aimed at describing the fate and behaviour of selected endocrine-disrupting substances in Austrian water bodies (Bursch et al., 2004). The project showed that contamination of Austrian freshwater ecosystems with such substances was comparatively low, and that there was no evidence of risk to human health, but that decomposition of certain detergents and pharmaceuticals presented some risk to fish. It highlighted the importance not only of providing adequate wastewater treatment but also of replacing certain endocrine disruptors with safer alternatives. Risk management measures for these chemicals under REACH are expected to create incentives for the development of safer substitutes.

In the context of REACH implementation, a hot-spot monitoring programme has been designed to measure exposure to chemicals used in the anthroposphere.[19] It will support the preparation of dossiers on candidate substances for authorisation. The monitoring programme comprises fixed monitoring sites (groundwater, surface water, sewage treatment plants, indoor, etc.), which are selected and investigated depending on the expected distribution of the substance under examination. Phthalates have been a major focus of monitoring activities. The Austrian authorities have envisaged submitting phthalates to an authorisation procedure under REACH, mainly on grounds of their potential impact on the reproductive system and suspected endocrine-disrupting properties (Box 4.6). A recent example involved monitoring 13 phthalates in house dust, sewage sludge and sediments. The survey led to Austria's nomination of some of them as candidates for authorisation as SVHCs.

Box 4.6. **Phthalate monitoring in Austria**

Phthalates are used as softeners in plastics. Many of them have wide dispersive uses and can be found in the environment (e.g. in water, sediment, sewage and biota), in indoor air and in many frequently used consumer products, including shoes, toys and cosmetic accessories such as brushes. Phthalates are very persistent and are produced in high volumes. There have been cases of them being found in very high concentrations, especially in matrices where they can be adsorbed onto particles (e.g. sediment, sewage sludge, household dust and particulates, both PM_{10} and $PM_{2.5}$). Recent measurements of the body burden of phthalates in humans has included phthalate metabolites in urine.

In 2008, Austria submitted SVHC dossiers for benzylbutylphthalate and dibutylphthalate. These substances were included in Annex XIV of REACH in February 2011 and their use will be subject to authorisation in the near future.

A 2009 human biomonitoring survey (Umweltbundesamt, 2011) initiated by the BMLFUW was designed as a cross-sectional study to determine the exposure of the general Austrian population to specific environmental contaminants (Box 4.7). The burden of chemicals in the body was investigated in several age groups. Urine samples were analysed for phthalate metabolites, trisphosphates, octylphenol, nonylphenol and bisphenol A. Blood samples were tested for polybrominated diphenyl ethers (PBDEs) and hair samples for methyl mercury. The results showed a body burden of phthalates and PBDEs in the Austrian population. Children are especially exposed to these chemicals, which are found in consumer products. Trisphosphates were identified in three samples. Methyl mercury, which is taken up primarily through fish consumption, was identified in low concentrations compared to countries with high fish and seafood consumption.

As part of an EU programme, a biomonitoring survey was conducted on pregnant women and newborns in Bratislava and Vienna to measure heavy metals, methyl mercury, bisphenol A and perfluorinated compounds. Other Austrian biomonitoring studies have found heavy metals in the bodies of schoolchildren (Umweltbundesamt, 2011). Biomonitoring studies have been limited thus far to a few hazardous chemicals. Broader monitoring of more substances in humans is required to establish further priorities for risk management regarding chemicals of concern.

Box 4.7. **Human biomonitoring**

The massive and diverse use of industrial chemicals results in increased exposure of humans to chemicals. Studies reveal that a variety of synthetic substances can already be detected in the human body. Taken up through various exposure routes, they are either stored in body tissues or metabolised and excreted. The procedure to detect the presence of certain substances or metabolites in the human body is called human biomonitoring. Urine, blood, milk, hair and tissue samples are most frequently used to identify the individual body burden. Studies demonstrate exposure trends, differences in subpopulations (notably vulnerable groups such as children – especially toddlers – and pregnant women), and local and regional differences.

7.2. Hazardous substances (pesticides and surfactants) in water bodies

In the framework of pollution control legislation, monitoring of water bodies is carried out on a regular basis. Around 2 000 groundwater monitoring sites, 250 river sites and 360 sediment sites are sampled several times per year. The only substances of concern which exceed the limit values at some sites are nitrates, the pesticide atrazine and its metabolite desethyl atrazine. However, concentrations have been steadily decreasing in recent years. Almost 80% of the sample points of Austrian rivers and lakes were found to have a “good” or “very good” status as regards the amount of hazardous substances found (Umweltbundesamt, 2010a).

In 2010 a special monitoring programme for 121 pesticides and pesticide components was carried out on selected groundwater and river sites considered at risk for pesticide contamination (Box 4.8). Measurements showed that overall environmental quality standards were met. Nonetheless, the conclusions of the special monitoring programme emphasise that sustainable and controlled use of pesticides is important to protect the

Box 4.8. **Pesticides in groundwater and rivers**

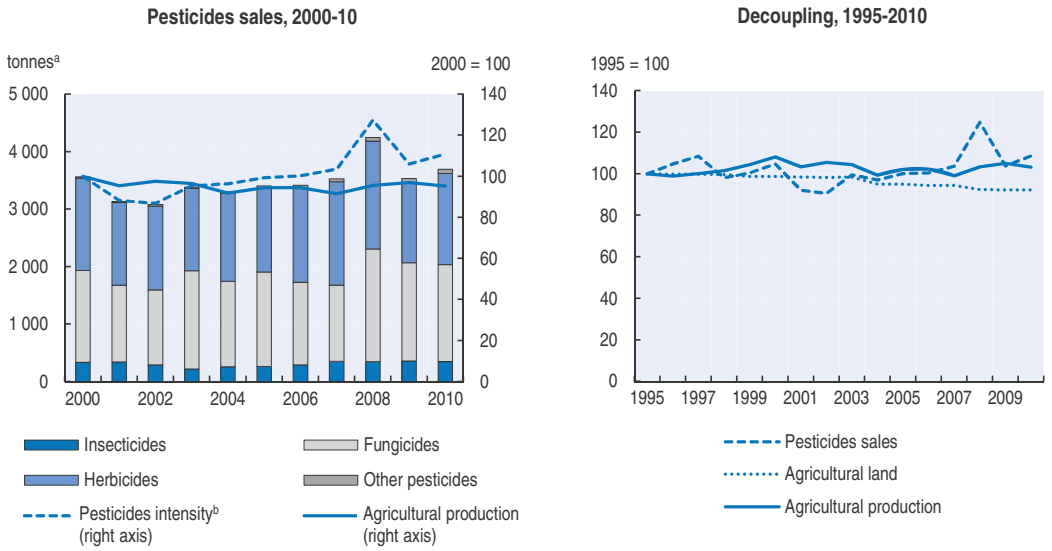
Groundwater areas extend to nearly one-third of the national territory. Nearly all drinking water consumed in the country is groundwater, a level unique in Europe. In 2010, a special monitoring programme targeted selected groundwater and river monitoring sites that could be threatened by pesticide contamination. Special attention was paid to the active substances of pesticides and their metabolites, which had not been monitored before; in all, 121 substances were monitored at 201 sites. At 92 sites (about 46%), the measured values exceeded the threshold levels for at least one substance. At 33 sites, multiple exceedances were measured. Of the 121 substances measured, 50 could be detected in groundwater, albeit at values well below the acceptable daily intake standards for drinking water. The groundwater contamination types often differed significantly and could be correlated with agricultural use. The measurements at river monitoring stations showed no exceedances of current environmental quality standards, but several substances for which no standards have yet been adopted were present in elevated concentrations (Umweltbundesamt, 2010b).

Source: Umweltbundesamt (2010b).

aquatic environment and the drinking water supply and to keep concentrations in water bodies as low as possible (Umweltbundesamt, 2010b).

Despite substantial subsidies for sustainable rural development and organic farming, however, pesticide sales in Austria did not decrease during the 2000s. The quantity of pesticides sold per square kilometre of farmland has tended to grow over the period while agricultural production has been essentially unchanged (Figure 4.3). Austria might wish to look into other ways of reducing pesticide use, such as a tax on pesticides.

Figure 4.3. **Sales of pesticides**



a) Weight of active ingredients.
b) Based on data expressed in terms of kg of active ingredients per km^2 of agricultural land.
Source: FAO (2013), *FAOSTAT* (database).

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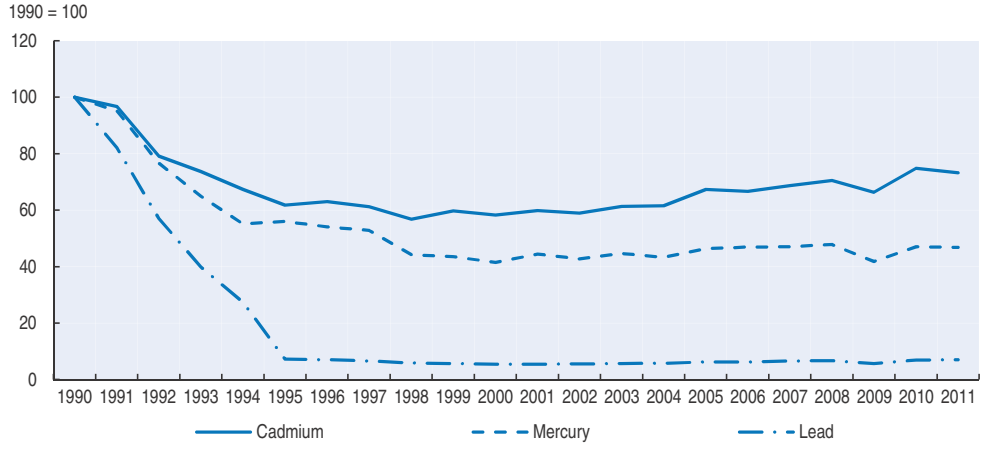
EU Regulation 648/2004/EC on detergents lays down degradation limits for surfactants such as linear alkyl sodium sulphonates (LAS), which are toxic to the reproductive system. In 1994-95, monitored concentrations of LAS in small rivers were around 820 µg/L, but by 2009-10 they were significantly lower, no more than 23 µg/L. This positive development has been attributed not only to the detergent legislation but also to the construction of wastewater treatment facilities.

7.3. Hazardous substances in ambient air

Levels of hazardous substances in air, such as POPs and heavy metals, as well as other pollutants are monitored regularly and reported in the Austrian National Emission Inventory, in accordance with the requirements of various international and EU agreements and the national air pollution control legislation.[20] Trend analysis (Umweltbundesamt, 2012) shows that cadmium, mercury and lead, which affect human health, have decreased significantly over the past two decades, but that both cadmium and mercury emissions are once again increasing (Figure 4.4).[21] The ban on leaded gasoline and the reduction in the use of coal and heating oil as well as flue gas cleaning technologies are responsible for the huge decrease in lead emissions. The rise in cadmium and mercury emissions in recent years is due primarily to increased use of biomass in power plants and industry, and to higher steel and iron production. The slight reduction in heavy metal emissions in 2008-09 reflects the reduced economic activity in those years.

Figure 4.4. **Heavy metal emissions**



Source: UNECE/EMEP (2013), *WebDab* (database).

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The same analysis shows that dioxin emissions in Austria have decreased by 76% in the past twenty years, with only 39 g being emitted in 2010. Hexachlorobenzene emissions dropped by 55% to 41 kg. Emissions of polycyclic aromatic hydrocarbons (PAHs) fell by 54% in the same period, to 8 tonnes. The positive trends are due to measures by industry and by waste burning installations to reduce emissions through process and technology innovations. Small, private firing plants and furnaces are the predominant emission sources (60-70%) for PAHs and dioxins. The publication and dissemination of a brochure on heating addressed to consumers and professionals such as chimney sweeps was an

important risk reduction measure. The brochure, published by the BMLFUW, explains ways of heating and firing which avoid high emissions of these pollutants (BMLFUW, 2010).

In the framework of Austria's obligations under the Stockholm Convention on Persistent Organic Pollutants, there are a number of monitoring programmes targeting POPs. Studies to measure POPs and other organic pollutants far from emission sources have shown that grassland soils in Austria are considerably affected by ubiquitous loads of POPs (Umweltbundesamt, 2010c).

Another project, carried out in co-operation with Germany, Italy, Slovenia and Switzerland (the MONARPOP Project), aims to monitor POPs in remote alpine regions to assess issues such as long-range transport, prevalent source directions, variation with altitude and possible biological effects of detected loads. Generally, higher POP concentrations have been found in the peripheral zones of the Alps, while the central and middle Alps are less polluted. The evidence demonstrates the role of the Alps as a barrier to long-range transboundary air pollution. A number of monitoring projects are carried out in co-operation with other countries, such as UM-MuKi with the Slovak Republic.

It is not clear that the results of these monitoring studies always influence policy making on risk reduction measures in Austria. The increased mercury and cadmium emission levels and the concentrations of POPs in grassland soils are examples. This is in contrast with the exemplary use of phthalate monitoring studies to trigger preparation of in-depth dossiers on SVHCs for consideration in the REACH authorisation process (Box 4.6).

8. The pollutant release and transfer register

Austria provides information to the public in a generally coherent, user friendly and effective way. *Chem News,* published about every two years, is a good example. Public consultations are regularly held as legislation is developed.

In the last *Environmental Performance Review*, the OECD recommended that Austria "introduce a pollutant release and transfer register (PRTR) and assure public access to the data thus generated" (OECD, 2003). Austria did establish a national PRTR in 2007, being one of the last EU countries to do so, although it had reported as required to the EU's European Pollutant Emission Register system since 2001 on emissions of 50 substances. The Austrian PRTR is run by Environment Agency Austria, which maintains a publicly accessible national electronic database with information from the 150 or so largest industrial installations, including chemicals manufacturers. However, as the chemicals industry uses many processes and produces a variety of products, it is difficult to estimate which processes result in release of post-threshold amounts of PRTR substances and greenhouse gases.[22]

Since 2009, Austria, like all EU countries, has reported annually on releases to air, water and land, off-site waste transfers and off-site transfers of pollutants (including heavy metals, pesticides, and dioxins) in wastewater. It also reports on releases and transfers of 91 key pollutants. In addition to the data required by the EU regulation, Austria includes releases from diffuse sources (such as transport or households) to air and water (OECD, 2010).

The aim of a PRTR is to provide information to the general public, industry and government to assist decision making and limit the impact of pollutants on human health and the environment. While there is some evidence that information provided to the PRTR, particularly that related to air and water pollution, is used for policy purposes,[23] the PRTR

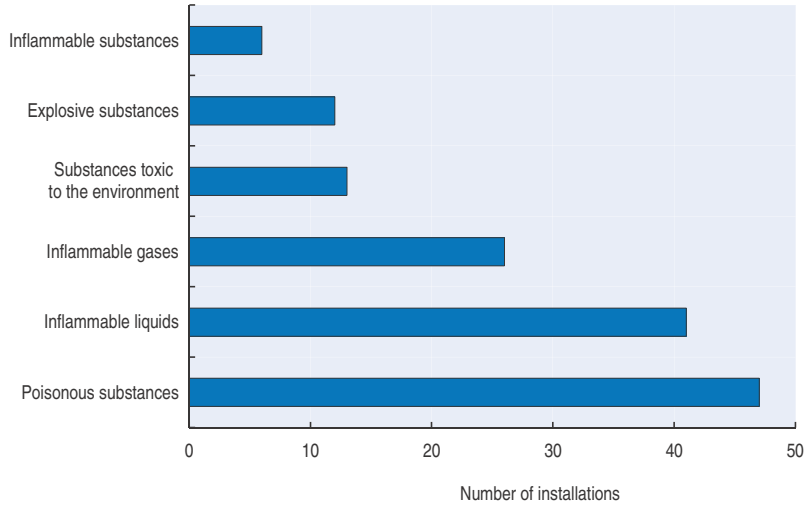
does not seem to be used by the Austrian public to the same extent as in some other EU countries. It lacks the transparency and user-friendliness needed to make it accessible to the public. Further efforts should be made to address these issues so as to better achieve the intended objectives of PRTRs.

9. Chemical accidents

The Ministry for Economy, Family and Youth is responsible for implementation of the Seveso Directive, but the BMLFUW holds certain related responsibilities, as does the Ministry for the Interior (on transboundary effects of major accidents). Inspectors for the *Länder* carry out inspections under the auspices of the economy ministry. Austria has 148 installations holding sufficient quantities of dangerous substances to be classified under the Seveso Directive. The number has remained almost constant over the past ten years. The installations are listed at the central registration office of the economy ministry, which issues annual reports on accidents. Very few accidents have been reported to the European MARS system, which documents major accidents under the Seveso Directive: one in 2003, one in 2004, three in 2006 and one in 2008.

A 2008 report commissioned by the BMLFUW analysed the effects of Seveso Directive implementation in Austria. It concluded that industry compliance on providing information to the public about preparedness and response to major accidents was not at the same level in all installations, although it had improved significantly under the Seveso II Directive, as had the overall safety level in Austria (Binter, 2008). Nevertheless, the report suggested that both operators and public authorities needed to be more proactive. Another challenge is related to the need for the land-use planning implications of major-accident hazards to be taken into account in the regulatory process. This is complicated in Austria, where land-use planning policies come under a variety of jurisdictions.

Figure 4.5. **Seveso installations by substance group**



Source: Binter (2008).

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10. Green chemistry

More stringent regulatory requirements provide incentives to producers to develop green chemistry solutions, i.e. to design chemical products and processes that reduce or eliminate the use or generation of hazardous substances and of environmental impacts more generally. The Austrian system for research funding provides additional incentives. Expenditure on research and development accounts for 17.5% of chemicals industry spending, and the industry is among the most research-intensive sectors in Austria. Financing from foreign sources in corporate research in Austria is double the EU average.

In 2011, the International Year of Chemistry, the BMLFUW organised a symposium on green chemistry. The symposium brought together scientists, interest groups, stakeholders and experts from administrations to discuss current research and develop perspectives for future activities. Following the symposium, a permanent discussion platform on green chemistry was established, and a study project is being commissioned to summarise green chemistry activities.

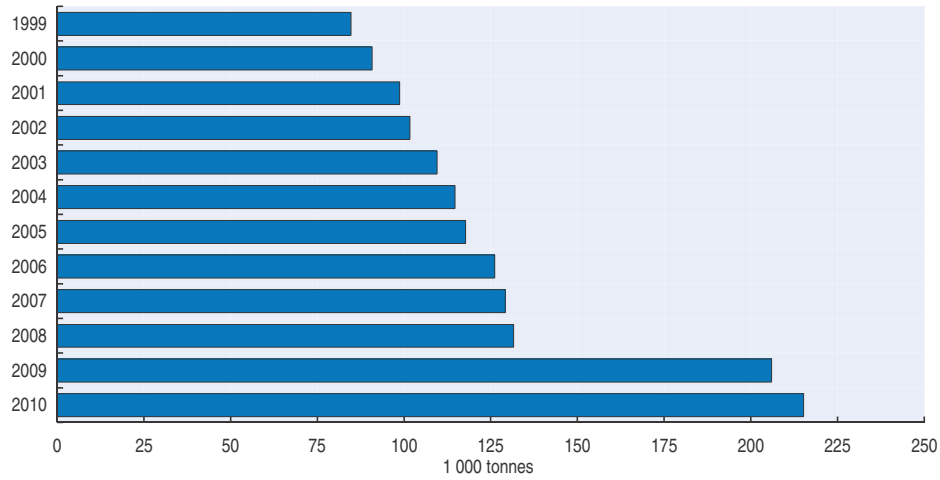
In addition, a platform has been established to exchange information about the substitution of less hazardous alternatives to hazardous chemicals. This effort, which began under the old International Forum on Chemical Safety, has been further developed in a "substitution portal" project supported by the EU, Germany and Austria to give a worldwide overview of approaches towards substitution.[24] The portal will be linked with Austria's chemical leasing initiative (see below) as well as with Austria's work within the authorisation part of REACH, in which substitution is a key element.

10.1. *Improving the environmental performance of chemicals production processes*

The chemicals sector has improved the environmental performance of its production processes in Austria and, on average, in Europe.[25] For example, recycling of the chemicals in plastics has grown considerably (Figure 4.6). Chemicals companies are increasingly looking at advanced recovery and recycling technologies to recover hydrocarbons locked within used and disposed-of plastics and polymers, thereby reducing their environmental impact.[26] The Austrian plastic recycling company Altstoff Recycling Austria recycled 215 165 tonnes of plastic in 2010.[27] The resulting plastic granules are used to manufacture new plastic products. They also serve as raw materials for the chemicals industry as well as for the incineration with heat recovery.

Due to efforts in cleaner production and efficient use of energy and raw materials, there has been a clear decoupling of greenhouse gas (GHG) emissions from production in the chemicals industry. GHG emissions related to chemicals industrial processes (excluding emissions from energy use in the sector) were reduced by over 50% from 2000 to 2011 (Figure 4.7). A 2009 report concluded that, taking a full carbon life cycle approach, for every unit of GHG emitted by the chemicals sector, the products of the sector enabled GHG savings two to three times greater than the emissions – a ratio that can rise to 4 to 1 under the right conditions (ICCA, 2009). This amounts to savings of up to 5.2 billion tonnes of CO_2. The study also identified opportunities for the chemicals sector to contribute to wider GHG savings through the development of green products such as insulating foams in buildings, agrochemicals, lighting, plastic packaging, automotive plastics, low-temperature detergents, engine efficiency techniques, synthetic textiles and marine antifouling coatings.

Figure 4.6. **Recycled plastic packaging**



Source: Austrian Federal Economic Chamber; Autrian Plastic Recycling.

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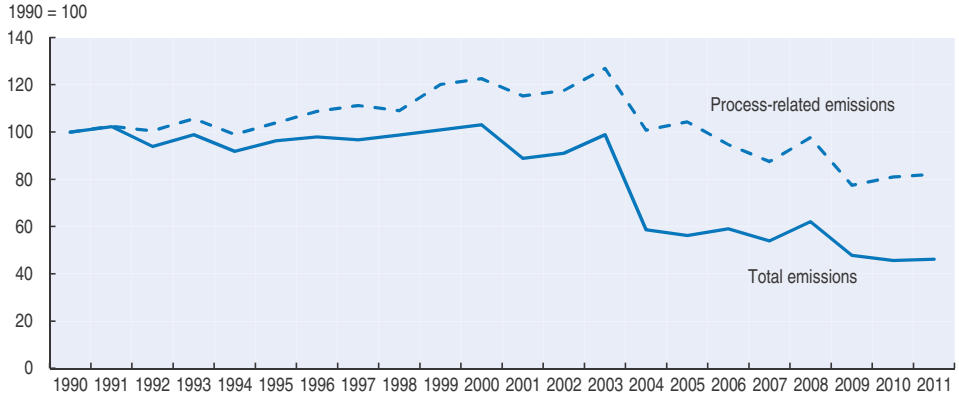
Figure 4.7. **Greenhouse gas emissions by the Austrian chemicals industry**



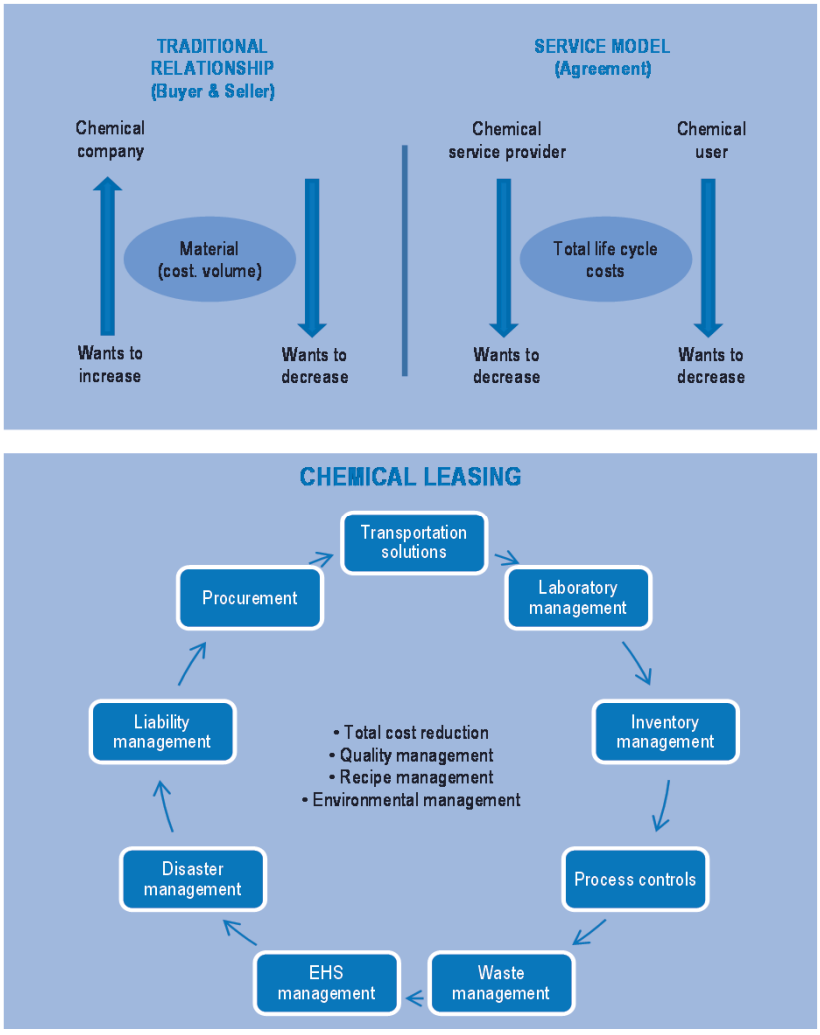
Source: UNFCCC (2013), *UNFCCC Data Interface.*

StatLink http://dx.doi.org/10.1787/888932895349

10.2. Chemicals leasing

Austria has pioneered chemicals leasing as a way to further reduce risks to human health and the environment from the use of chemicals. Traditionally, suppliers have an interest in selling as much chemicals quantity as possible to end users. By contrast, end users have an interest in minimising chemicals purchases, and must put in place systems to manage potential health or environmental risks associated with chemicals' use and disposal. Chemicals leasing changes the incentive structure. The supplier sells services provided by chemicals (e.g. powder coating, dyeing, painting) but retains ownership of the chemicals. The end user only pays for these services, rather than the volume of chemicals consumed, while retaining ownership of machinery and responsibility for the manufacturing process (Figure 4.8). Thus suppliers and end users have a common interest in redesigning processes to minimise losses of chemicals to the environment. By

Figure 4.8. **The concept of chemicals leasing**



Source: Adapted from UNIDO Chemical leasing initiative (www.chemicalleasing.com).

decoupling payment from the consumption of chemicals, chemicals leasing can encourage better chemicals management, generating both environmental and economic benefits (UNIDO, 2011).

Austria considers chemicals leasing to provide a means of complying with REACH obligations. Chemicals leasing and REACH share a philosophy of ensuring compliance with a duty of care, and provide a way of demonstrating adequate control. The Austrian and German governments are working together to bring chemicals leasing within the purview of EU chemicals policy and regulations.

Studies commissioned by the BMLFUW have shown that, potentially, almost 4 000 Austrian companies could benefit from chemicals leasing, cutting the annual use of 150 000 tonnes of chemicals by one-third. One study suggested that the average cost saving achieved by chemicals leasing would be about 15% (Jakl and Schwager, 2008). However, uptake of chemicals leasing has fallen short of the potential. Drawing on similar

experiences with energy efficiency and cleaner production, Austria should examine obstacles to wider application to identify how they could be overcome.

Austria has also been active in promoting chemicals leasing internationally. In 2004, the Austrian government and the United Nations Industrial Development Organisation began co-operating to promote chemicals leasing internationally. Five years later, the German government joined this initiative. Chemical leasing projects were initiated in 2005 in Egypt, Mexico and Russia, followed in 2008 by projects in Colombia, Morocco, Serbia and Sri Lanka. All were sponsored by Austria.

11. International co-operation on chemicals management

Austria plays an active role in international co-operation on chemicals management. It works with partners in the region, especially German-speaking countries, and with bilateral partners in the global chemicals management context to undertake initiatives related to risk management. It supports development of a new instrument on mercury and consolidation of institutions working on chemicals-related issues at global level to address policy fragmentation and avoid duplication of effort. Austria has ratified the main chemicals conventions (see below). However, it has not yet fully implemented the UNECE Aarhus Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (Chapter 2). More transparency and public participation in environmental decision making in such issues as the siting of industrial installations, including those producing chemicals and pesticides, would be desirable in Austria.

Austria ratified the Vienna Convention in 1987 and its Montreal Protocol on ozone-depleting substances in 1989, and was active from the beginning of the negotiations resulting in the phasing out of chlorofluorocarbons and hydrochlorofluorocarbons.

Austria ratified the Stockholm Convention on Persistent Organic Pollutants in 2002. In 2012 it revised its national implementation plan on elimination and reduction of POPs to include a national action plan on unintentionally produced POPs (PCDD/F, PCBs, HCB, PeCB, PAHs). Key aspects of the revised plan are continued monitoring in the Alps (MONARPOP); strict control of compliance with the EU Regulation on POPs,[28] especially for products, which is enforced by specialised inspectors in the *Länder*; and prevention of pollution related to POP waste.

Austria ratified the Rotterdam Convention on the Prior Informed Consent (PIC) Procedure for Certain Hazardous Chemicals and Pesticides in International Trade in 2002. As required by the convention, Austria has regularly informed importing parties of the intention to export substances that are banned or severely restricted within Austria and the EU, that are not subject to the PIC procedure.[29]

Environment Agency Austria actively participates in EU-funded "twinning" projects in the area of chemicals policy. By entering into close partnership with corresponding institutions in new and future EU countries, as well as partner countries in Eastern Europe and the southern Mediterranean, the agency supports the development and implementation of chemicals management programmes in those countries in line with EU requirements. Activities include study visits and secondments, advice on the role and organisation of competent authorities for chemicals issues within the EU, transfer of best practices in safe management of chemicals, support for inspection programmes and specialised laboratories. Bulgaria, Croatia, Romania, Serbia and others have been partners

in projects of this kind. Contacts established within this framework form a valuable basis for continuing co-operation.

Austria participates in efforts to implement the Strategic Approach to International Chemicals Management (SAICM), adopted in 2006 by the International Conference on Chemicals Management. The objective of this non-binding UN initiative is to achieve sound management of chemicals throughout their life cycle so that, by 2020, chemicals are used and produced in ways that lead to minimisation of significant adverse effects on human health and the environment. More than 150 countries participate in this effort. As envisaged in SAICM's Overarching Policy Strategy, initial capacity-building activities for reaching SAICM objectives are supported through its Quick Start Programme (QSP). The QSP includes a voluntary, time-limited trust fund, administered by the United Nations Environment Programme, and multilateral, bilateral and other forms of co-operation. Austria has regularly contributed to the fund, as one of 21 donors, since its establishment in 2006, contributing almost 2% of total QSP funding to date.

Austria attends the meetings of the OECD Chemicals Committee and takes an active part in selected activities under the OECD Chemicals Programme, notably the Task Force on Biocides, which it has chaired for several years, and the Working Group on the Safety of Manufactured Nanomaterials, where it played a major role in organising a recent workshop in Slovenia to assist in raising awareness on nanosafety issues. It also participates in the work on test guidelines and good laboratory practice and has sponsored seven chemicals to be assessed under the Co-operative Chemicals Assessment Programme, but has not yet taken an active part in the co-operative assessment work itself.

Notes

1. Germany is the largest chemicals producer in Europe, followed by France, Italy and the Netherlands. Together, these four countries generated 64% of EU chemicals sales in 2010, valued at EUR 315 billion. The share rises to 89%, or EUR 437 billion, with the addition of the United Kingdom, Spain, Belgium and Poland. The other 19 EU countries generated 11% of EU chemicals sales in 2010, valued at EUR 54 billion, half of it attributable to Sweden, Austria, the Czech Republic and Finland (CEFIC, 2011).
2. The exception was 2009, when both imports and exports fell by about 10% compared with 2008.
3. About a thousand international companies, many of them multinationals, co-ordinate their eastern European business outreach from Austria (ABA, 2011).
4. REACH: Regulation (EC) No. 1907/2006; CLP: Regulation (EC) No. 1272/2008; BPR: Regulation (EC) No. 528/2012.
5. Several other laws also apply to chemicals management – for example, on poisons and fluorinated gases – but they will not be considered further here.
6. Major accidents in the chemicals industry have occurred worldwide. In Europe, the Seveso accident in 1976 prompted the adoption of legislation aimed at the prevention and control of such accidents. In 1982, EU Directive 82/501/EEC, known as the Seveso Directive, was adopted. In 1996, it was replaced by Directive 96/82/EC, or Seveso II. This directive was extended by Directive 2003/105/EC and applies to thousands of industrial establishments where dangerous substances are present in quantities exceeding specified thresholds. In 2012, Seveso III (Directive 2012/18/EU) was adopted; it comes into force in 2015. It includes stronger requirements for provision of information to the public and access to justice.
7. Regulation (EC) No. 2006/166/EC.
8. Certain other regulations on chemicals management in force in Austria go beyond EU legislation, such as the 2011 Poisons Act, which regulates sales of poisons and preparations containing poisons through a licensing procedure. The regulation aims at ensuring that only customers with documented expertise or experience are entitled to purchase these severely hazardous products.

9. The effects of a substance when it becomes waste has to be taken into consideration in the context of REACH implementation, and there are many other links between waste and chemicals management that also should be emphasised. As the borderline between "product" and "waste" is of key importance for life-cycle chemicals management, enforcement in Austria puts particular focus on that question. Together with stakeholder organisations, the BMLFUW is holding workshops highlighting specific situations and borderline cases, and trying to elaborate ways to deal with them.
10. Companies that produced or imported chemicals having certain properties hazardous to human health or the environment had to register these substances in 2010. The next deadline is 2013, for substances produced or imported in volumes between 100 and 1 000 tonnes a year, and 2018 is the deadline for substances produced in volumes below 100 tonnes.
11. Österreichischer REACH-Helpdesk: *www.reachhelpdesk.at*.
12. SVHCs must meet one or more of the following criteria: Class 1 or 2 carcinogen; Class 1 or 2 mutagen; Class 1 or 2 toxic for reproduction; PBT (persistent, bioaccumulataive and toxic); vPvB (very persistent and very bio-accumulative); or evidence of an equivalent degree of concern (e.g. endocrine disruptors).
13. The substances are benzylbutylphthalate, dibutylphthalate, 2-ethoxyethanol, 2-methoxyethanol, 2-ethoxyethylacetate, diglyme, tris-2-chloroethyl-phosphate), di-isopentylphthalate and azo-di-carbonamide.
14. The ministries involved are those dealing with the economy, social affairs, health, and environment.
15. EU-wide co-ordinated forum enforcement projects began in 2008. The scope of the REACH-EN-FORCE-I project was to verify compliance by manufacturers and importers of substances with the REACH obligations for pre-registration and safety data sheets. The REACH-EN-FORCE-II project goes further, focusing on downstream users and formulators. REACH-EN-FORCE-III deals with customs and border control.
16. Maximum residue levels are the upper levels of pesticide residues legally permitted in or on food and feed of plant and animal origin, as set by Regulation (EC) No. 2005/396 to ensure the lowest possible consumer exposure. They are based on good agricultural practices.
17. Over 20 stakeholder organisations, representing business, academia, NGOs, the public, etc. were involved in its elaboration.
18. Each year a two day conference enables representatives of authorities from these countries to share experiences and discuss presentations by experts.
19. The anthroposphere is the part of the environment that is made or modified by humans for human activities and human habitats.
20. UNECE Convention on Long-range Transboundary Air Pollution and Directive 2001/81/EC on National Emission Ceilings for certain atmospheric pollutants.
21. From 1990 to 2010, cadmium emissions decreased by 28% to 1.1 tonnes, mercury by 54% to 1 tonne and lead by 93% to 14.9 tonnes.
22. It is especially difficult to estimate releases to water, since there are hardly any individual data on releases from specific installations or processes. This is due in part to the fact that in some large industrial parks, such as those near Linz and Vienna, several chemical companies use the same treatment facilities for wastewater (Umweltbundesamt, 1999).
23. Concerning emissions to water, analyses using PRTR data are provided in reports based on the EU Water Framework Directive. At national level, Austria's Water Management Plan exploits this data. Trends and analyses of releases to air are provided in the Austrian Air Emission Inventory.
24. Substitution Support Portal: *www.subsport.eu*.
25. For example, between 1990 and 2005, the European chemicals industry cut its energy intensity by 3.6% annually. Absolute GHG emissions, meanwhile, fell by almost 30%.
26. Recycled polymers can be produced by depolymerisation, a process in which the polymers are broken down into their constituent monomers for formation into new polymers.
27. Altstoff Recycling Austria runs nationwide systems for the collection and recovery of household and commercial packaging waste. It was founded in 1993 by the Austrian trade and industry association to execute the Austrian Packaging Ordinance on behalf of the companies affected and to sustain a packaging eco-cycle system.

28. Regulation (EC) No. 850/2004.

29. As chemicals are banned or severely restricted at EU level, the European Commission, rather than individual countries, notifies the convention secretariat of the regulatory actions taken to ban or severely restrict the use of chemicals in Europe, with a view to including the affected chemicals in the list of substances subject to the PIC procedure.

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PART II

Chapter 5

Climate change adaptation and climate-related natural hazards

Austria has a long-established system for managing climate-related natural hazards. Climate change adaptation is a newly emerging policy area that has recently moved into the implementation phase. This chapter outlines the challenges posed to Austria by current and future climatic conditions. It assesses the policy and institutional framework, along with the process and tools used to identify priorities for climate change adaptation policies. The main challenges to implementation of the National Adaptation Strategy are identified, including securing finance and effectively mainstreaming adaptation into sectoral policies. The Austrian contribution to supporting adaptation activities in other countries is also discussed.

Assessment and recommendations

Austria's terrain is particularly prone to natural hazards. Financial losses from extreme weather events have been increasing, largely due to increased development in higher-risk areas. The high potential impact and frequency of natural hazards have led to strong political support for risk reduction measures. As a result, Austria has a comprehensive, effective and well-funded administrative system for managing the consequences of natural hazards, mainly floods. There has also been a move towards increasingly integrated natural hazard management, which focuses on factors that may affect vulnerability, such as land-use planning, in addition to traditional flood defences. While all this provides a good basis for responding to some of the effects of climate change, enhanced co-ordination of government action is necessary to meet the challenge.

Austria is the seventeenth OECD country to have published a National Adaptation Strategy (NAS), and the Austrian strategy is one of the most comprehensive. It provides information on likely climate changes and sectoral impacts, an overview of ongoing adaptation initiatives, a portfolio of adaptation recommendations and guiding principles for prioritising actions. As the strategy was only approved in 2012, it is too early to assess its implementation. However, the process of its development has demonstrated some clear strengths, as well as challenges that will need to be overcome in order to achieve the strategy's objectives.

Development of the strategy built on strong domestic research capacity supported by substantial government funding. Climate change observations, future scenarios and a qualitative vulnerability assessment provided a sound basis for adaptation planning. A status-quo report about ongoing adaptation initiatives highlighted gaps. Another pillar of the NAS was extensive stakeholder engagement, involving about 100 organisations over three years. This approach, with active participation and involvement going far beyond normal practice, widened the scope from the original scientific focus, integrated perspectives of other relevant groups and helped raise stakeholder awareness. It also facilitated the emergence of a "climate change adaptation community". However, as interest and activities concerning adaptation remain concentrated in the environment ministry and agency, a key challenge is to secure support for measures in other sectors and at other levels of government. There is thus a need to extend and deepen political and administrative support for climate change adaptation at all levels of government, and to build on the stakeholder participation process.

It is also vital to clearly define responsibilities and arrangements for implementation. The NAS identifies potentially relevant actors, but timescales and responsibilities for actions remain unclear. Strengthening the mechanisms for co-ordination, with clear agreements on roles and functions, could assist in this process. Implementation of the NAS will require close co-operation between the federal government and the *Länder*, as the latter have legislative competence in many of the key areas for climate change adaptation. Given that this is a new policy area, it is particularly important to have a robust monitoring

and evaluation system in place to identify whether the programme is on track, and to refine subsequent phases of the national programme. The current absence of specific targets and criteria for assessing progress could impede the development of such a system.

Environment Agency Austria has set up an online database of ongoing and completed adaptation projects. It lists some 300 projects and indicates the extent of adaptation activities in various sectors and at various levels of government. Most projects are carried out at national level and are research oriented. Many projects focus on natural hazard management and "no-regrets" options. Overall, the range of projects seems to align well with the relative vulnerability of the sectors. However, activities are likely to be under-reported, particularly those carried out by the private sector and at local level. In addition to sector-specific activities, Austria has taken steps to mainstream climate change adaptation throughout government operations. One such step was the Climate Impact Test, a mandatory test on climate change mitigation and adaptation applied to proposed federal regulations. It was later integrated into the new regulatory impact assessment process, in force since 2013. It is too early to evaluate the extent to which the new procedure effectively takes adaptation issues into account.

A common challenge faced by OECD countries, including Austria, is the mismatch between the evidence of climate impacts currently available and that required by end users, particularly policy makers. In developing the evidence base, it would be useful to consider how to strengthen the organisational links between producers and consumers of climate data. Continued and enhanced co-operation with other Alpine countries would also be beneficial, including at local level. In addition, support to adaptation efforts in developing countries is among the priorities identified in the government's strategic guidance on development and the environment, and additional funding has been recently provided for this purpose. However, funding remains modest compared to other countries.

There is significant scope for strengthening the evidence base on the costs and benefits of adaptation-related investments and measures. This is particularly important to inform decisions on budget allocations and to make the case for directing an appropriate level of resources to adaptation. Unlike some other national adaptation strategies, the NAS does not provide an estimate of the financing required for its implementation, nor for research and dissemination. Given pressures on public finances, securing adequate financing is a challenge, and it will be important to explore the full range of potential funding sources. Austria has already made good use of collaboration through EU and Alpine initiatives to leverage additional funding. The potential for increased recourse to insurance markets and public-private partnerships should be explored. At present, neither individuals nor businesses bear the full cost of their exposure to climate risk, which effectively acts as a subsidy for high-risk areas.

Recommendations

- Strengthen the formal mechanisms for horizontal and vertical co-ordination of adaptation policy, such as interministerial and federal-*Länder* working groups, clarifying roles and functions.
- Further mainstream climate change adaptation into government policies – for example, by incorporating the effects of climate change into *ex ante* assessment procedures such as environmental impact assessment and strategic environmental assessment.

Recommendations *(cont.)*

- Specify and prioritise adaptation actions, including their timescales and expected costs and benefits, and compare them with alternative uses of public funds.
- Systematically monitor and evaluate progress in implementing the National Adaptation Strategy, on the basis of concrete targets, criteria and a clear allocation of responsibilities.
- Allocate sufficient financial resources for climate change adaptation, taking account of costs and benefits, and explore the potential for increased involvement of private finance as well as recourse to insurance markets and public-private partnerships.
- Further improve scientific knowledge on climate change vulnerabilities and impacts, including social aspects, at regional and local scales and intensify research co-operation with other Alpine countries; strengthen dialogue between scientists and decision makers, for example by establishing a co-ordinating group and/or adjusting the responsibilities of an existing body.

1. Introduction

Austria's mountainous terrain gives rise to a variety of natural hazards, such as avalanches and floods. It also affects the manner and extent to which climate change will affect Austria. Some climate change impacts were explored in previous work by the OECD (2007). As a country with an advanced economy, an educated workforce and strong public services, Austria is in a strong position to deal with the effects of a changing climate. The potential for taking action to minimise costs and exploit opportunities arising from a changing climate can be seen in the effective system of natural hazard management that has developed over the past decades. However, co-ordinated government action will be required if this potential is to be realised.

Like many other OECD countries, Austria has developed a National Adaptation Strategy (NAS) to direct, co-ordinate and communicate federal government action on adaptation. The NAS was completed in May 2012 and the Cabinet approved it on 23 October 2012. The initiative for developing the strategy came from the Kyoto Forum, a co-ordination group. Created in 1999 by Austria's federal environment ministry, now the Ministry of Agriculture, Forestry, Environment and Water Management (BMLFUW), to enhance co-ordination of mitigation activities, the forum brings together representatives of the BMLFUW, the *Länder*, municipalities and local areas. The group's call for action was influenced by growing recognition of the need to prepare for the effects of climate change, as well as developments at the EU level such as the Green Paper on Adaptation, and international moves such as negotiations related to the United Nations Framework Convention on Climate Change (UNFCCC). The development of a national strategy was included in the Austrian government programme for 2008-13.

The BMLFUW was responsible for co-ordinating the strategy development, with considerable support from Environment Agency Austria. The scientific community intensively supported the creation of the strategy with projects to develop improved climate projections and better understand impacts, vulnerabilities and adaptation. In recognition of the cross-cutting nature of adaptation policies, the development of the strategy entailed a wide-ranging process of stakeholder engagement and consultation.

As Austria is at an early stage of implementation, it is not yet possible to assess the performance of the policy framework for adaptation. Instead, this chapter focuses on whether the key elements are likely to be in place for strategy implementation to be effective. It also examines Austria's record of natural hazard management policies and makes some comparison with other OECD countries in discussing Austria's process for developing adaptation policy.

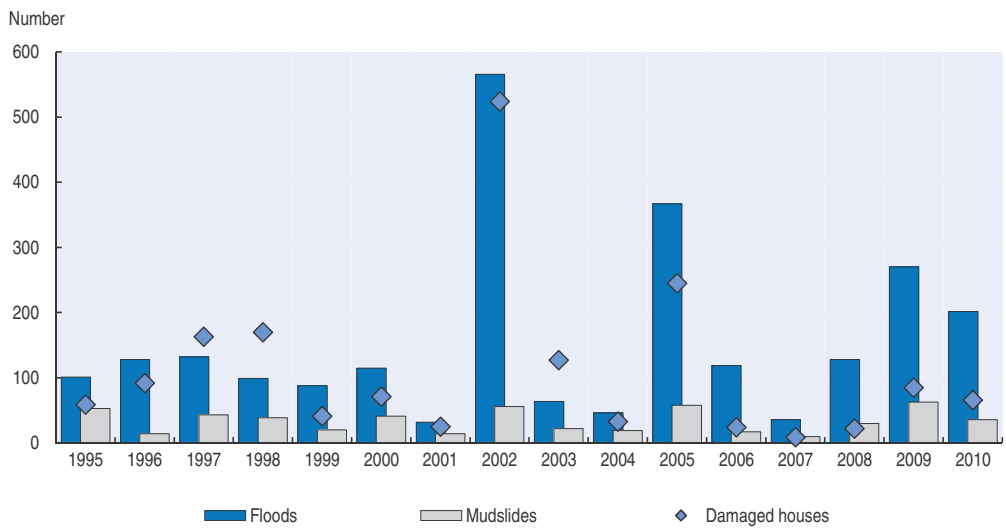
2. Current and predicted effects of climate in Austria

2.1. *Climate and physical conditions*

Austria's climate is shaped by its mountainous geography. The west and the south have an alpine climate, while the lowlands in the east and north have a temperate climate. This varied terrain leads to marked differences in climate variables within a comparatively small area. For example, average annual precipitation varies considerably between the west (2 500 mm) and the east (500 mm).

Two of the main climate-related natural hazards in Austria are floods and mudslides. Figure 5.1 shows the considerable variation from year to year in the extent of flooding, with particularly severe floods having occurred in 2002 and 2005. There is no clear trend over the period shown.

Figure 5.1. **Number of floods and mudslides**



Source: BMLFUW (2011).

StatLink http://dx.doi.org/10.1787/888932895368

Some impacts of climate change are already observable in Austria, such as glacier melting, permafrost thawing and an increased number of hot days (BMLFUW, 2012a). In particular, there are two notable aspects of these changes. The first is that mean temperatures in Austria have been increasing faster than the global rate (EEA, 2008 and 2009). Global mean temperatures have increased by 0.8 °C since pre-industrial times, compared with a rise of about 2 °C in the Greater Alpine Region, which includes Austria. Between the 1980s and 2007, mean temperatures in the Alpine region increased by 1.2 °C. The second aspect is the countervailing trends in precipitation. Precipitation in the wetter

western part of the country has increased over the past century, while in the drier east it has decreased (Auer et al., 2005).

Limitations in modelling tools have meant considerable uncertainty about how these trends will evolve. The global circulation models used to generate climate projections are not well suited to produce results for mountainous countries such as Austria because their coarse resolution means they cannot capture the influence of geographic features on local climates. Significant investment in the development of more detailed regional models to help fill this gap led to the reclip:century project in 2011. It concluded that winter precipitation in Austria and in the Greater Alpine Region is likely to increase by between 8% and 13% by 2050, and that temperatures will increase throughout the year, by 1-2.5 °C in summer and by 1.6-2.2 °C in winter (AIT, 2013).

These projected climate changes are expected to exacerbate mass movements of soil and rock debris in mountainous areas, which can also put lower-lying areas at risk, and the south-eastern provinces might be affected by longer droughts. Heat waves are expected to be an increasing problem, especially in urban areas. Climate change is also expected to lead to increases in natural hazards (ClimChAlp, 2008; Korck et al., 2011):

- probable increase of floods in frequency and amplitude;
- increase of avalanche frequency and run-out distances;
- extreme low water periods and droughts, mainly in summer;
- risk of rock falls and rock slides;
- intensified soil erosion;
- intensified risk of forest fires.

2.2. Economic impacts and vulnerable economic sectors

The most economically significant climate-related hazards in Austria are currently floods and storms. This can be seen from the EM-DAT disaster database (CRED, 2013), which contains details of major disasters (more than 10 casualties or 100 people affected, or a declaration of a state of emergency). Over the past 20 years, estimated damages from the 10 largest natural disasters in Austria amounted to USD 5.4 billion, with flooding accounting for USD 3.5 billion and storms USD 1.3 billion.[1] Total economic losses are considerably higher because of indirect effects on economic activity. While there is no clear evidence that trends in natural disasters are linked to increasingly severe weather, economic and population growth in higher-risk areas have contributed to an increase in associated economic losses. Low penetration of private natural hazard insurance means the bulk of these costs accrue to those directly affected and to the public sector (Section 4).

The Austrian government has estimated that the sectors likely to be most directly affected by climate change are agriculture and forestry, (winter) tourism, water management and hydropower. In terms of their significance to the economy, agriculture and forestry accounted for about 2% of gross value added in 2011 and tourism contributed 5.5%, while more than half of electricity is generated from hydropower (Chapter 1). As well as these direct effects, climate change is likely to indirectly affect the other, larger economic sectors. Disruption to infrastructure and energy production caused by climate change would have follow-on effects for industry and retailing. The financial services and insurance sector is also potentially at risk as a result of increased pay-outs for damage to insured assets and changes in the performance of investments.

A previous OECD study (OECD, 2007) analysed the implication of climate change for winter tourism in the Alps. It found that increases in mean temperature would lead to decreasing snow reliability. The most sensitive country is Germany, with Austria the second most sensitive. This sensitivity is caused by the prevalence of comparatively low-lying skiing areas. As a consequence, the study estimated, a 2 °C increase in temperature would reduce the number of snow-reliable skiing areas from 199 to 155. A 4 °C rise would reduce the number of snow-reliable areas to 47.

The Austrian ski industry is already investing heavily in measures to increase the reliability of its ski runs. The primary tool has been the use of snow machines to provide adequate cover: according to figures from the Austrian cableways association, investments in these totalled EUR 800 million in the five years following 2008.[2] As a result, snow is guaranteed on 70% of the slopes in Austria. However, as temperatures (or humidity, or both) increase, so do the volumes of water and energy required, and the costs. As described in OECD (2007), there is also a technical limit because the machines generally require a temperature below –2 °C to be effective. Ultimately, rising temperatures could increasingly disadvantage Austrian ski slopes relative to Alpine countries with access to higher slopes, though opportunities may arise from increased summer tourism.

2.3. Social impacts

There is no clear trend in deaths from climate-related natural hazards in Austria, given the infrequency of major disasters. The most significant event in recent years was the heat wave in 2003, which led to 345 more deaths than the average for that time of the year, according to Robine et al. (2007). The second most significant event was an avalanche in 1999 that led to 31 fatalities. Major floods have affected large numbers of people but led to relatively few recorded deaths (CRED, 2013). In 2002, 60 000 people were evacuated from their homes during flooding and there were nine recorded fatalities.

Some groups are particularly vulnerable to the effects of climate-related disasters and climate change. Individuals' age, education and wealth can affect their vulnerability to these effects (IPCC, 2012). The NAS recognises the importance of this point, stating that social inequalities can be reinforced through vulnerability to the environment. It also reiterates the message of the 2010 Austrian Strategy for Sustainable Development, which states the importance of dealing with economic, social and environmental challenges in an integrated manner (Chapter 2).

There is a lack of evidence on the social effects of climate-related hazards and climate change in the Austrian context. An EU-funded study used GIS mapping to identify links between physical and social vulnerability in the Salzburg river basin. The study found a correlation between the two forms of vulnerability, but further work would be required to determine whether the results apply more widely. In addition to this mapping, the NAS identifies a number of key research questions on social vulnerability that remain to be answered.

3. Policy and institutional framework

3.1. Objectives and priorities for natural hazard management and climate change adaptation

In recent decades, the federal government and the *Länder* have established a comprehensive and effective administrative system for addressing risks from natural hazards. The overall objectives are:

- Limiting existing risks to human health, material assets, economic activities and the environment to acceptable levels, and preventing new unacceptable risks, in order to preserve the basis for sustainable, hazard-proof and climate-proof development. This requires a long-term, planned approach.
- In light of climate change, reviewing existing structural protection measures to assess their current condition, their functionality and their operability, and keeping this information up to date.
- Ensuring that hazard and risk maps remain up to date, taking into account relevant alterations in natural and man-made systems.
- Further enhancing co-ordination and co-operation between spatial planning and risk management, for example by forming a partnership between spatial planning and natural hazard-relevant authorities and institutions to address gravity-induced natural hazards (e.g. landslides, rock falls).
- Strengthening individual preparedness and precaution by *a)* increasing public awareness, *b)* supporting individuals in strengthening/adopting their material assets by local structural protection and *c)* supporting the establishment of co-operative structures and public-private partnerships regarding risk precaution, such as water boards and co-operatives.

The objective of Austrian adaptation policy is to reduce the adverse impacts of climate change by managing potential risks and exploiting potential opportunities arising from a changing climate. In fulfilling this objective, the NAS applies the typology of sustainable development, noting the importance of making Austria's society, economy and ecosystems more resilient to the effects of climate change. It also specifically notes that potential opportunities will arise from the effects of climate change and emphasises the need to take advantage of them. While the proposed approach is similar to that used by other OECD countries' strategies (Mullan et al., 2013), the Austrian strategy document is one of the most comprehensive developed so far. It provides a general framework (BMLFUW, 2012a), with information on likely climate change impacts and adaptation options, but also assesses potential social implications and research gaps. The NAS outlines a catalogue of adaptation options in 14 areas of activity, which are laid out in detail in a separate action plan (BMLFUW, 2012b).

It is important to note that the options identified in the action plan are recommendations for potential responses, rather than being a commitment to undertake a set of concrete adaptation measures. In general, the adaptation options identified in the NAS are broad in scope, allowing for varying degrees of implementation. Box 5.1 presents examples of adaptation options, highlighting opportunities for mainstreaming activities.

To help decision makers prioritise adaptation measures, Environment Agency Austria and the Wegener Centre for Climate and Global Change at the University of Graz developed a set of seven criteria (Table 5.1). These criteria can be assessed with the help of an Excel-

Box 5.1. **Selected examples of options for climate change adaptation**

- Improvement of irrigation management and implementation and support for water-saving methods and technologies in agriculture.
- Adaptation and diversification of tree species and targeted management of forests to foster biodiversity and to regenerate old forest stands. The aim of this option is to increase the resilience of forests to pests and to increase stability and forest diversity in terms of species, structure, genetics, diversity of habitats, etc.
- Increased use of planning tools and technical measures to secure freshwater supply in water-scarce areas.
- Measures and infrastructure work to improve flood management.
- Strategic consideration of climate change impacts in tourism strategies.
- Optimisation of the electricity grid infrastructure to prevent foreseeable undersupply or overcapacity, as well as adaptation of generation capacity and grids to climate change projection.

based tool called SALDO. Each criterion is composed of several indicators. Questions for each indicator guide the user through the assessment process.[3] Some of the indicators can be quantified while others require a qualitative assessment. The tool provides a menu of options for the qualitative indicators, such as no/low/high potential for averting irreversible damage. On the basis of the answers, the tool automatically calculates a value for each criterion. Drawing on expert opinions about current availability of climate information and the relative importance of each item, the developers of the tool suggest using the weights displayed in Table 5.1 as an interim solution (Bednar-Friedl et al., 2011).

Table 5.1. **Seven criteria for prioritising adaptation measures**

A	Importance	Potential to prevent damage	0.70
		Potential to prevent irreversible damage	0.30
B	Urgency	Damage today	0.30
		Future damage	0.30
		Lead time	0.20
		Durability/longevity	0.20
C	Climate policy objectives	Synergies/conflicts with other climate protection measures	0.60
		Synergies/conflicts with adaptation in other areas	0.40
D	Environmental and social consequences	Environmental consequences	0.40
		Impact on protected natural resources	0.20
		Social consequences	0.40
E	Flexibility	Uncertainty range	0.60
		Change of action	0.40
F	Economic rationality/benefit	"Big option": Cost to achieve a specific objective and cost-benefit ratio for various climate scenarios	0.50 each
		"Small option": Investment and operating costs	0.50 each
G	Feasibility	Technical, institutional/political, social	No weight

Source: Bednar-Friedl et al. (2011).

All seven criteria for the overall assessment of an adaptation option are weighted equally in the default scheme so as to avoid privileging some criteria over others. The NAS recommends choosing weights through a stakeholder process, taking into account the

reliability of available climate information. Overall, this system for prioritisation appears to be both transparent and pragmatic, given limitations in data availability. Nonetheless, it is focused on choosing among adaptation options, rather than informing a comparison between investments in adaptation and other government priorities and helping arrive at trade-offs when budget decisions must be made (Section 4).

3.2. Governance for disaster risk management

The system for managing natural hazards in Austria is complex and generally effective. Depending on the scope of a disaster, the response is co-ordinated by the smallest unit possible, whether the municipality, the district administration, the *Land* or the federal government. The federal government is responsible for response to major catastrophes through State Crisis and Catastrophe Management (SKKM). This body, established in 2004 and overseen by the Ministry of the Interior, brings together all ministries, the *Länder* and emergency organisations, whose emergency units previously worked independently of each other. The SKKM co-ordinates response to major natural and other hazards that affect a large part of the Austrian territory, last relatively long or are particularly complex and require co-ordination among *Länder*. The federal level also has primary responsibility for dealing with pandemic disease, rail or air accidents and major incidents related to forestry.

The *Länder* have primary responsibility for most disaster relief related to natural hazards, including the organisation of relief services and provision of resources for emergency assistance and disaster relief measures. All *Länder* have enacted legislation and established administrative structures to define responsibilities at local, district and state levels. Emergency relief is largely supported by organisations of trained volunteers. Over 400 000 people in Austria volunteer for disaster relief (BMASK, 2009). Their efforts are supported by the federal and state governments, which provide resources for training and equipment. The two leading organisations are the Austrian Fire Brigade and the Austrian Red Cross. There is also a long history of voluntary co-ordination among *Länder* to deal with cross-boundary issues. Experience so far suggests that current systems for collaboration are effective for sharing information and co-ordinating approaches.

Risk prevention is carried out by a large number of federal and state entities. For example, the *Länder* and municipalities can influence risk levels through their control over land-use planning and construction codes. At federal level, the BMLFUW includes two bodies that play an important role in the prevention of natural hazards: Torrent and Avalanche Control, which works in high-altitude areas, and the Federal Water Engineering Administration for lower altitudes, including valleys. Both co-operate with a network of institutions and administrative entities in the area of natural hazard prevention and disaster protection. These include the Hydrographic Service, the Central Institute for Meteorology and Geodynamics, the state forest services and state warning centres, the avalanche warning service, state geologists, fire departments, avalanche commissions and mayors.

Torrent and Avalanche Control observes, assesses and manages natural hazards. It is responsible for information gathering; hazard zone planning; planning, implementation and monitoring of protection measures; managing finances for protection against natural hazards; carrying out immediate response after torrent and avalanche events; and providing advice and analysis. Another important task is the monitoring of the catchment areas of torrents and avalanches, carried out at regional level. Torrent and Avalanche Control is divided into regions, which mostly correspond to the *Länder*. It has three

independent units, dedicated to geographic information, geology, and snow and avalanches. The Federal Water Engineering Administration co-ordinates the construction and operation of flood management structures and the designation of hazard zones and flood discharge areas. In many areas, its tasks also include reimbursing losses incurred by people who live in designated flood discharge areas. Its activities are carried out at the *Länder* level.

3.3. Governance for adaptation policy

In line with the approach taken by many OECD countries, lead responsibility for climate change adaptation lies with the BMLFUW. From the perspective of aligning responsibilities with control, it is helpful that the ministry also has responsibility for some key climate-sensitive sectors: water, forestry, natural hazards and agriculture. Environment Agency Austria contributed technical expertise to the design and implementation of the NAS. It also established an adaptation website[4] and managed the stakeholder participation process (see below).

Many adaptation issues do not sit neatly within institutional boundaries, so the Austrian government made pragmatic use of existing co-ordination mechanisms to assist with the development of the strategy. In the late 1990s, the government created two groups addressing mitigation policies. Their remit was later expanded to encompass adaptation policy as well. The Inter-Ministerial Committee on Climate Change (IMC Climate) manages co-ordination between federal ministries. It is chaired by the BMLFUW and includes working-level representatives from various ministries. Representatives of the main interest groups and the *Länder* are invited to its meetings on an *ad-hoc* basis. The second group is the Kyoto Forum, which more systematically brings together the different levels of government, including the *Länder*.

In addition to these standing arrangements, the development of the NAS involved an extensive process of consultation and engagement with a wide range of stakeholders, including around 100 institutions. The process of stakeholder engagement took place over several years, beginning in 2007. The approaches used for engagement were tailored to the characteristics of the audiences:

- For the general public, a questionnaire on the Internet was available to all citizens. It asked for assessment of given topics, and people could give individual recommendations and comments at the end. A report on the results published in 2010 on the government website claimed that results were considered in discussions and workshops held after the evaluation of the questionnaire.
- For non-government organisations (NGOs), businesses, public authorities and other organisations, consultation was used to identify key issues, develop initial recommendations and identify implementing issues and further research requirements. The first phase of this process (autumn 2008 to summer 2010) involved 43 institutions, and five one-day workshops were held. In the second phase (autumn 2010 to summer 2011), 96 institutions were involved. In addition, the BMLFUW engaged in three consultations rounds.
- Expert input was initially solicited through the AustroClim climate research initiative. A broader process of expert engagement then took place through written consultations and several mini-workshops. This work was used as the basis for the initial policy paper, published in June 2009.

While the design of the strategy was a very inclusive process, there remains a need to clarify responsibilities and procedures for implementation. The NAS identifies relevant parties for each action, but does not clearly assign responsibilities or indicate timescales for delivery, although these are sometimes implicit in the recommendation. It is particularly important to actively involve all relevant ministries and to effectively organise the modes of co-operation (e.g. by establishing an *ad hoc* interministerial working group or strengthening existing institutional groups), with clear agreements on the roles and functions of process leader and process partners. Additionally, developing more concrete timescales and descriptions of actions and associated responsibilities would facilitate the process of monitoring and evaluation (Section 6).

Making climate change adaptation a real cross-cutting issue that is jointly addressed at the national and *Länder* level will be a challenge. A clear political mandate to clarify roles and responsibilities, particularly outside the BMFLUW, would be useful step in this regard. There is a need to extend and deepen political and administrative support for climate change adaptation, as interest and activity on adaptation are still concentrated in the BMLFUW and Environment Agency Austria. As it stands, there is a risk of adaptation continuing to be perceived as a solely environmental issue and it may prove difficult to secure support for measures outside that domain, leading to uneven implementation. It will be important to build on the positive experience of the stakeholder participation process to raise awareness of adaptation by senior policy makers such as ministers, members of relevant parliamentary commissions and senior officials. Targeted communications activities will be an essential element. In addition to strengthening horizontal co-operation among ministries, vertical co-operation with the *Länder* and municipalities will be needed for NAS implementation, as the subnational authorities have legislative and administrative powers in many of the key areas for climate change adaptation. The involvement of the private sector, the social partners and NGOs has also to be clarified. The NAS participatory process has in this respect already provided a valuable basis.

3.4. Improve information about climate change impacts

There is an active climate research community in Austria that produces information on climate, impacts and adaptation. Government funding has supported this community, focusing on Austrian issues, but has also encouraged international co-operation to leverage greater resources, particularly as part of EU-funded initiatives (Table 5.2).

Table 5.2. **National research programmes and funds**

Institution/Programme	Focus	Duration	Budget
. .	Research to support development of NAS	2008-2011	. .
Klima and Energiefonds programme: ACRP	Climate change impact, vulnerability and adaptation	2008-2010	EUR 4-5 million per year
BMLFUW and other ministries, BOKU, Environment Agency Austria and other institutions programme: StartClim	Topic is flexible, depending on emerging questions in research	2003-ongoing	Between EUR 100 000 and EUR 200 000 per year
Federal Ministry of Science and Research programme	Climate change impact and adaptation	2002-2006	EUR 3 million
Austrian Academy of Science Global Change programme	Climate change impact	1990-ongoing	. .

Source: BMLFUW; Environment Agency Austria.

Following severe flooding in 2002 the StartClim research platform was created to instigate and co-ordinate climate research, with funding provided by the Austrian government and a variety of other institutions. The initial focus was on improving understanding of extreme events, but it has expanded to include research into climate impacts and adaptation responses. Further funding for climate research has been provided through the Austrian Climate Research Programme. In addition to this domestic research agenda, Austria has been an active participant in EU-funded research, such as the CIRCLE I and II projects co-ordinating transnational research funding on climate change impacts, vulnerability and adaptation.

Research related to climate change observations, future scenarios and a qualitative vulnerability assessment have provided a sound basis for adaptation planning. A central achievement has been the development of spatially detailed climate projections: a set of regionalised models provides projections up to 2050 for greenhouse gas (GHG) scenarios A1B and B1,[5] with 10-km x 10-km grid spacing. This work is being extended to provide projections to 2100 and to reflect higher GHG emissions. A qualitative vulnerability assessment has provided policy makers with comprehensive information on the most affected sectors (water, tourism, agriculture, forestry, electricity and energy, housing and construction, health, ecosystems and biodiversity, and transport/infrastructure). Two reports resulting from this work (Haas et al., 2008; Balas et al., 2010) provided a robust foundation for the development of the NAS.

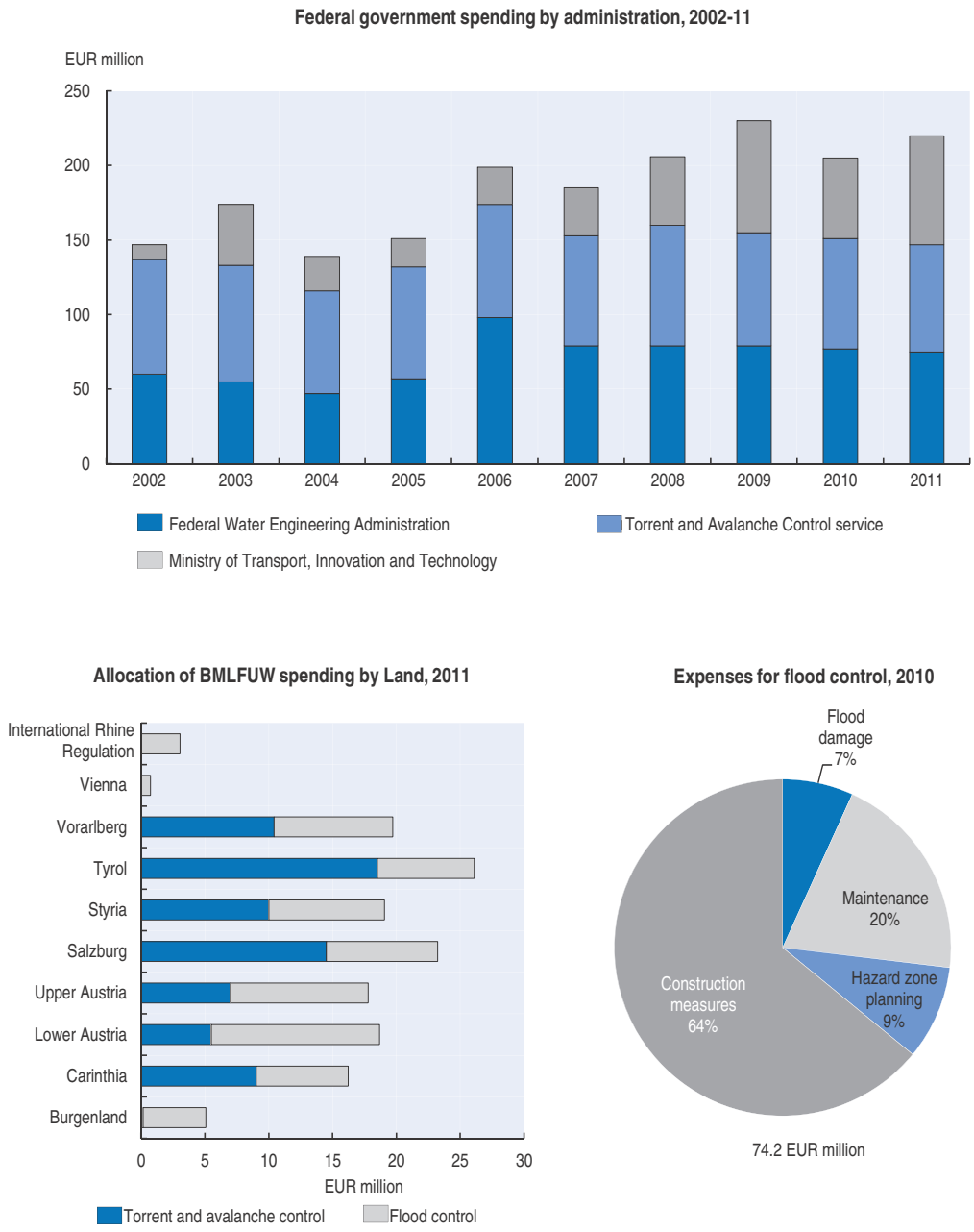
As a starting point for the development of the NAS, the BMLFUW also published a "status-quo" survey (Gingrich et al., 2008) aiming to identify the extent of adaptation activities under way at the time, including options to manage risks and options that could help in exploiting opportunities. This research subsequently provided the basis for an online database of adaptation measures, which is now regularly updated as new information becomes available (Section 5.2). The database has the potential to foster peer learning and there is scope to further exploit its potential as a decision-making and communications tool. However, it does not contain information about measures' financial cost or expected benefits.

A common challenge faced by OECD countries, including Austria, is the mismatch between the evidence that it is currently possible to provide and that required by end users. This is particularly an issue for natural hazard management, because the climate processes causing hazards operate on a small scale. The variety of geographies and micro-climates means that it can be misleading to apply average results generated for larger areas (PLANALP, 2012). In developing the evidence base, the continuation and intensification of exchange and co-operation with other Alpine countries would be beneficial. In 2011 Austria established the Climate Change Centre Austria to strengthen the organisational links between producers and consumers of climate data.

4. Finance for adaptation policies and measures

The federal government spent in excess of EUR 200 million per year on the management of natural disasters between 2008 and 2011 (Figure 5.2). The majority of such funding is channelled through the Federal Disaster Fund, which receives 1.1% of federal tax revenue. About three-quarters of the funding is directly used for disaster prevention. The rest is used to cover a variety of areas, including indirect provision for disaster preparedness (e.g. providing equipment to fire departments and funding early-warning systems), and to provide partial indemnities for the costs of natural disasters. Households

Figure 5.2. **Public spending for protection from natural hazards**



Source: BMVIT and BMLFUW (2012); BMLFUW (2012), *Facts and Figures 2012*.

StatLink http://dx.doi.org/10.1787/888932895387

and businesses are usually reimbursed 20-30% of their losses, with the costs split between the federal government (60%) and *Länder* (40%). In addition, some smaller funding sources are available.

Despite the resources being allocated to disaster risk management, there is an upward trend in losses from natural disasters. This is due partly to improved reporting systems, but predominantly to increases in the value of assets located in high-risk areas. There is

potential for moral hazard resulting from the design of the indemnity system, although expenditure on this covers only a fraction of total losses. The Federal Disaster Fund allows both the *Länder* (responsible for land-use planning) and individuals and businesses to avoid bearing the full cost of their exposure to risks. This effectively acts as a subsidy for high-risk areas. It is very difficult to get comprehensive private insurance (which in principle would have premiums aligned to risks) because insurers believe the risks to be too high for them to offer affordable policies. The Austrian Insurance Association estimated that only EUR 400 million of the 2002 flood losses were covered by private insurance, out of as much as EUR 3 billion (Habersack and Moser, 2003). Nevertheless, one element of the adaptation action plan is to encourage increases in the uptake of private insurance with the aim of reducing demands on the disaster fund.

The financing of adaptation policies and measures remains a major gap with respect to NAS implementation. The strategy provides no information on the costs of actions listed, nor does it identify specific sources of finance. The current approach adopted by Austria and many other OECD countries is to require the resources for adaptation to be found within existing budget envelopes. This approach has the advantage of ensuring that additional spending on adaptation measures satisfies existing tests for delivering value for money and is integrated into wider government priorities.

However, the risk with this approach is that lack of funding leads to lack of action. A successful mainstreamed approach to financing requires sufficient incentives for decision makers to include adaptation, tools for assessing the benefits of adaptation measures and a robust system of monitoring and evaluation to identify any implementation gap. Only some of these elements are currently in place. The lack of evidence on the costs and benefits of adaptation actions in Austria makes it generally difficult to justify additional spending in this area, relative to other budget priorities. In an effort to address this issue, Austria plans to conduct an economic assessment of the cost of inaction and arrive at an estimate of adaptation costs by mid-2015.

In addition to strengthening the evidence base, pressures on public finances make it important to explore the full range of potential funding sources. Austria has already made good use of collaboration though EU and Alpine initiatives to leverage additional funding. There would be value in exploring the potential for increasing involvement by the private sector in financing adaptation actions, which could reduce pressures on public finances while also building awareness and capacity in the private sector.

5. Mainstreaming adaptation

5.1. *Mainstreaming adaptation priorities throughout government operations*

Austrian environmental impact assessments (EIAs) are required to consider a range of impacts caused by projects, including their effect on GHG emissions. The legal framework governing EIAs explicitly states that projects' impact on emissions has to be described, and, if necessary, offsetting measures must be included. There is no corresponding requirement to consider the effects of a changing climate, even though many of the types of projects subject to EIAs are also likely to be sensitive to such effects. A survey of activity within OECD countries (Agrawala et al., 2010) found that a number of countries intend to include climate change adaptation within the EIA process. This is one element of the Spanish climate change adaptation strategy, for example. In Australia, there is no legal requirement, but in practice there is evidence that climate impacts are being taken into

account. The most advanced country in this respect is Canada, where there is a requirement to incorporate the effects of climate change into the appraisal of major projects.

The process of strategic environmental assessment (SEA) in Austria is guided by the relevant EU directive. It gives member states considerable flexibility in terms of which elements are included within the SEA process, provided that the process achieves the overall objective of assessing (and, where necessary, addressing) environmental considerations. Again, the use of SEAs in Austria does not specifically require consideration of climate change adaptation, other than indirectly through the requirement to assess the likely evolution of the environment in the absence of the programme or plan being assessed. However, the absence of a requirement to assess adaptation does not preclude this step if it appears to be relevant.

The clearest example of mainstreaming adaptation into government operations was the Climate Impact Test, now superseded by the regulatory impact assessment (RIA) procedure introduced in 2013 (Chapter 2). The test, applied whenever federal regulations were proposed or revised, covered both climate change adaptation and mitigation. Introduced in 2008 as part of the implementation of the Climate Change Strategy, it was supported by a range of capacity-building activities co-ordinated by the BMLFUW. The test started with an initial screening process to determine if climate change was likely to be relevant; if so, this was followed by an assessment process and then the consideration of options to address any negative impact. For climate change adaptation, regulators were required to assess possible climate impacts in four areas: human health; infrastructure and location; land use, landscape, ecosystems and biodiversity; and water resources. The presumption was that the most climate-friendly alternative would be selected. Legislative texts were required to include a statement on the climate relevance of the act and alternatives considered, and, if the alternative chosen was not the most climate-friendly among those considered, a short statement of justification.

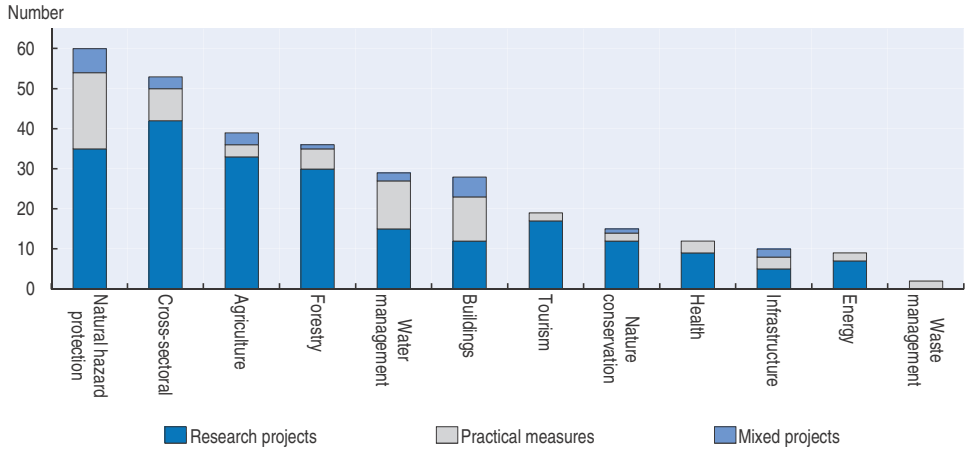
In 2013, as part of a wider revision to the regulatory impact assessment process, the Austrian chancellery started to develop an integrated tool for policy appraisal and assessment. The intention was to deal with consideration of cross-cutting issues, such as climate change, in a single process rather than using specific stand-alone impact tests. This tool has the potential to reduce administrative burdens from impact assessment and increase consideration of climate change beyond those currently undertaking assessment. As was the case with the Climate Impact Test, it is set to be applied both to new regulations and in cases of substantive revision to existing ones.

Overall, there is scope to intensify efforts to mainstream climate change adaptation throughout government operations. A first step would be to encourage the update of the mechanism for mainstreaming adaptation currently in place. The second priority in this area is to broaden the scope of interventions to ensure that key decisions are captured. The Climate Impact Test was a useful starting point, but further guidance could be provided to encourage adaptation to be considered within SEAs, EIAs and RIAs. The OECD (2009) has identified some key areas for integrating consideration of climate change adaptation: policy design, budgetary allocation, procurement and project implementation. Mainstreaming efforts to date have focused on policy design, while the other areas have yet to be addressed. In particular, the government could explore how adaptation is integrated into procurement and budgetary allocation. Given the fact that many key responsibilities lie at state level, it will also be important to extend mainstreaming into *Land* systems and processes.

5.2. *Mainstreaming adaptation in key vulnerable sectors*

The government's online database of ongoing and completed adaptation projects gives indicative information about current efforts in climate change adaptation. As of 2013, it contains 312 examples of adaptation projects, most of them undertaken at national level (185), with 79 projects at *Land* level and 48 projects at EU level. Nearly 70% of the projects focused on research to assess potential climate change impacts and adaptation options. Practical measures accounted for 23% of the projects and the rest combined research and practical measures (Figure 5.3). With regard to the natural environment, there was a focus on the Alpine region (49 projects) and activities related to flowing waters (34) and urban areas (31), yet most projects were not associated with any one particular natural environment. Activities are carried out by a broad range of actors, mostly research institutes and universities but also government entities at all levels, sometimes in co-operation with private partners.

Figure 5.3. **Climate change adaptation projects as of 2013**



Source: Umweltbundesamt (2013), Database of Adaptation Projects (www.klimawandelanpassung.at/datenbank/).

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The database indicates the extent of adaptation activities in various sectors (Figure 5.3). A majority of projects relate to natural hazard management, an area of particular importance for Austria irrespective of climate change, and many projects involve multiple sectors. These results are suggestive of the distribution of activities among sectors. Projects can vary dramatically in scale and ambition. There may also be variations in the extent to which different types of organisations are likely to report their activities. In particular, parts of the private sector may view adaptation as a source of competitive advantage, which discourages them from publicising their activities. Some measures to address climate variability may not be labelled as such (Agrawala et al., 2011). In particular, more decentralised and autonomous efforts are likely to be under-reported (Gingrich et al., 2008). The sectoral scope of projects seems to align well with the relative vulnerability of the sectors and the preference of the Austrian government for "no-regrets" options that would be important elements of natural hazard management even without climate change. Examples are the development of a more structured approach to risk management in communities in Tyrol, the documentation of natural hazards in the Alpine region and the development of a mobile phone application and service providing severe weather alerts via free text messages.

Agriculture and forestry, tourism, water management and hydropower are the sectors particularly vulnerable to climate change. Projects in the agricultural and forest sector are largely for research. Adaptation is often a side benefit of projects, for instance when solar power is used for cooling or measures are introduced to prevent forest fires. Water management is one of the few areas in which a large part of projects have a practical component. Most of these projects are no-regrets options as well, since the cost of floods has been increasing because of the accumulation of assets in high-risk areas. In addition, a study commissioned by the BMFLUW and the entities responsible for water management in the *Länder* (BMLFUW, 2010) has shown that for the period up to 2050 there is no need for immediate practical measures for climate change adaptation. For example, floods were projected to vary between –4% and 10% relative to scenarios with no climate change. An example of a no-regrets project is co-operation between the BMLFUW and the insurance industry on an Internet-based risk zoning system for natural hazards, particularly floods, that allows very high resolution visualisation of high-risk areas and damage potential.

Interestingly, relatively few projects target the tourism sector, even though it is vulnerable to climate change and makes a significant contribution to Austria's foreign exchange balance (ANTO, 2013) and GDP. The reason might be that the sector is perceived to be relatively flexible in responding to gradual changes in climate, for example through increased summer tourism to make up for shortfalls in winter activities, so adaptation measures could be taken later. Fully exploiting the potential benefits of summer tourism will, however, require advance planning and co-ordination. There is also a lack of practical measures in the energy sector. As analyses of climate change impacts suggest that there is no immediate need to undertake practical adaptation measures with regard to hydropower (BMLFUW, 2010), projects focus on understanding climate change impacts, except for a few practical measures aimed at introducing district cooling from biomass or waste-to-energy plans, which would also have a positive impact on climate change mitigation.

5.3. Disaster risk management and flood prevention

The effects of climate change are not currently viewed as particularly significant for the management of natural hazards. The conclusions of the OECD (2007) still hold true: "many hazards which have strong linkages to climate change actually have relatively low/medium economic significance". The clearest impact of climate change on natural hazards involve glacial and permafrost areas, which may be of limited economic significance from a national perspective, although the implications for local communities may be quite significant. "On the other hand, hazards which have considerably higher economic and social significance, such as floods and windstorms, have more complex and less certain linkages with climate change." Despite the uncertainty of climate change impacts on flooding and winter storms, the related risk should be taken seriously, given the impact of such events and the growing vulnerability to them on the part of Alpine societies because of demographic, land use and other pressures.

The Austrian NAS includes specific adaptation options within natural hazard management to improve prevention and respond to such events. The effects of climate change are being integrated into policy development through the concept of "permanent adjustment". This recognises that climate change is only one of a number of natural and socio-economic processes that will drive the extent and magnitude of natural hazards. The recurrence of torrents, avalanches and other natural hazards has led to a policy of "living with natural hazards and risks". In essence, this is a broader approach to reducing risk

from natural hazards: in addition to technical measures to manage risk, it encompasses education, land-use planning and building standards. The relevant adaptation options in the Austrian NAS include support for individual risk prevention and management (one-stop shop for information about climate change adaptation and natural hazards, provision of climate-relevant information, improvement of early warning systems, increased awareness of private insurance options, promotion of technical options to protect assets), sustainable land-use planning to avoid exposure of assets to natural disasters, and water management through water retention and deliberate flooding to avoid discharge peaks. Additionally, the NAS includes a package of actions to improve disaster risk management, such as increased flexibility in financing for disaster risk responses and extension of training courses for disaster risk management coverage.

Floods are a significant natural hazard in Austria: flooding caused damage estimated at EUR 3.7 billion between 2000 and 2010. Flood risk management is guided by EU Directive 2007/60/EC on the assessment and management of flood risks. The directive was transposed into national law with the 2011 Flood Directive. To facilitate implementation, a working group brings together all entities at national and *Land* level that work on flood protection. As required by the law, Austria has completed a flood assessment of all watercourses and zoning of areas with significant flood risk. Risk and hazard maps are expected to be available by the end of 2013, and Austria plans to develop transboundary flood risk management plans by the end of 2015.

Investment in hazard protection amounted to EUR 1.8 billion between 2002 and 2011. The government estimates that every euro invested prevented damage of almost double its value. The flood protection system is comprehensive and includes engineering measures, such as dams and retention basins, as well as land-use planning measures that make space for excess water without putting the population at risk, and the documentation of water flows and assessment of future risk. The government communicates information and recommendations on flooding to help individuals and businesses manage their risk. The current evidence suggests that changes in future flood risk due to the effects of climate change fall within existing design tolerances of the flood protection infrastructure. Therefore, the Austrian government does not plan to strengthen the technical standards for flood protection for now. The situation will be revisited as the evidence evolves, in line with the concept of "permanent adjustment" described above.

6. Monitoring and evaluation

As part of the NAS implementation, it will be necessary to develop a system for monitoring and evaluation. The BMLFUW is to co-ordinate this process, and the first implementation report is due in 2014. The report is intended to provide a detailed analysis of the status of NAS implementation, based on an interview survey of relevant officials and predetermined monitoring criteria. Further reporting is to be carried out every two years (BMLFUW, 2012a; EC, 2012). In developing this framework, the BMFLUW will have to overcome the absence of specific targets or indications of success, which makes it challenging to provide a consistent and robust overview of progress on implementation. For the mid- to long-term perspective it is therefore recommended to build up a more systematic approach to monitoring and evaluation, based on a more concrete specification of the actions to be completed.

Another potential area for development is with respect to linking the monitoring and evaluation processes with the refinement of policies over time. This is partly an issue of process, insofar as the production of results needs to be aligned with the policy-making cycle. However, it is also an issue of methodology. A focus on the implementation of actions in the NAS is important, but it is not sufficient to inform the revision of future iterations of the strategy. Some other OECD countries, including Germany and the UK, are developing systems that also provide information on key trends in climate-sensitive sectors, for example losses from flood damage. Collecting and interpreting this information can help identify emerging issues and changes in priority for existing ones, thus informing the development of subsequent iterations of adaptation strategies.

7. International co-operation

There are a number of major transboundary waterways within Austria, including the Rhine, the Danube and its tributary the Mur. The 2007 EU Directive on the Assessment and Management of Flood Risks (2007/60/EC) placed a legal requirement on member states to co ordinate the management of transboundary rivers and, in particular, to avoid taking any action that would significantly increase flood risk in neighbouring countries (UNECE, 2009). However, in the case of Austria this was largely a reiteration of existing practice. It is an active member of the relevant international commissions for transboundary waterways.

Austria is a signatory to the Alpine Convention, a legal mechanism facilitating co-ordination among Alpine countries to support sustainable development. In 2006, the convention's ministerial declaration on climate change identified nine priority actions to address climate change adaptation. One lasting outcome has been the integration of climate change into the platform for sharing knowledge and experience on natural hazard management (PLANALP, 2012). High-level experts from the Alpine countries meet to share experiences and best practices on natural hazard management, and the role of this group has now been expanded to provide a greater focus on the challenges posed by the effects of climate change.

In addition to co-operating with other European countries in the management of transboundary issues and knowledge sharing, Austria supports efforts in developing countries to adapt to climate change. This support is identified as a priority in the government's strategic guidance on development and the environment. The guidance lists a set of areas for action, including mainstreaming, linking with disaster risk reduction and supporting innovative approaches to community-based adaptation in Africa.

The overall context for this action is provided by the Austrian system of providing official development assistance (ODA). The Foreign Ministry sets the overall strategic direction, while implementation is the responsibility of the Austrian Development Agency (Chapter 3). Funding is provided by federal ministries, the *Länder* and municipalities. Austria provided USD 1.11 million (0.28% of gross national income) in total ODA in 2012, slightly below the average for members of the OECD Development Assistance Committee (DAC).

Within this framework, the total provision of funding specifically for adaptation activities remains modest. According to DAC figures, only USD 6.2 million of Austrian bilateral ODA in 2011 (USD 2.3 million in 2010) was identified as having climate change adaptation as a principal objective, with a further USD 8.9 million of projects having adaptation as a significant objective (USD 3.3 million in 2010). This means 2.8% of Austrian ODA directly supported adaptation projects, compared with an average of just under 7.8%

for all DAC members. It is, however, important to note that there are only two years for which adaptation data are available, and as such these figures represent only a snapshot of activity. Moreover, as this is a new system for adaptation, there is still some variation between countries with respect to how they have applied the Rio Marker criteria (Figure 3.9).

The DAC database lists eight adaptation projects funded by Austria. These focus primarily on capacity building rather than implementation of concrete adaptation measures. From the location and project descriptions, these projects do not appear to have been systematically designed to exploit the expertise gained within Austria on management of natural hazards in mountainous regions. Instead they cover a range of geographies and types of intervention, from climate risk reduction in Ethiopia to financing of a field station in a Costa Rican national park.

In addition to these projects, the Austrian Development Agency has an objective of mainstreaming adaptation to climate change into development activities. The objective, expressed in Austria's Fifth National Communication to the UNFCCC, is to use development assistance to target the root causes of vulnerability to the effects of climate change. These efforts focus on poverty alleviation, conflict prevention and improving the management of natural resources. This mainstreaming process is intended to ensure that non-adaptation-related funding nonetheless contributes to reductions in vulnerability. In some cases, development-as-usual activities should contribute to reducing climate vulnerability, while others can inadvertently increase it. Guidance has been provided by the OECD and others to facilitate this process (OECD, 2009), but it is not clear which approach has been adopted by the Austrian Development Agency to facilitate the mainstreaming of climate adaptation into its work.

There is currently a lack of evidence on the effectiveness of this mainstreaming approach in terms of its effect on funding allocations and project design. Explicit monitoring and evaluation of the approach would help ensure that it is achieving its desired objectives, and inform the development of future interventions.

Notes

1. These estimates do not include casualties.
2. Statement by Franz Hörl, Chairman of the Association of Austrian Cableways, *http://portal.wko.at/wk/dok_detail_file.wk?angid=1&docid=1985021&conid=667225* (April 2013).
3. For instance, under category A, "Importance", the user is asked to select the number of sectors affected by the measure (Indicator 1), estimate the monetary value of economic damage the measure could prevent (Indicator 2) and assess whether there is a potential for averting damage that is irreversible or cannot be quantified (Indicator 3).
4. *www.klimawandelanpassung.at*.
5. The Intergovernmental Panel on Climate Change developed 40 scenarios based on four broad storylines (A1, A2, B1, B2) to model possible developments in the 21st century. A1 assumes "very rapid economic growth, global population that peaks mid-century and declines thereafter, and rapid introduction of new and more efficient technologies. Major underlying themes are economic and cultural convergence and capacity-building, with a substantial reduction in regional differences in per capita income". A1B further assumes that technological change in the energy system will be balanced across all sources. B1 assumes a "convergent world with rapid change in economic structures toward a service and information economy, reductions in material intensity, and introduction of clean technologies. The emphasis is on global solutions to economic, social, and environmental sustainability, including improving equity, but without additional climate change policies". A2 and B2 have a stronger focus on self-reliance and local solutions, with slower economic growth and technological change.

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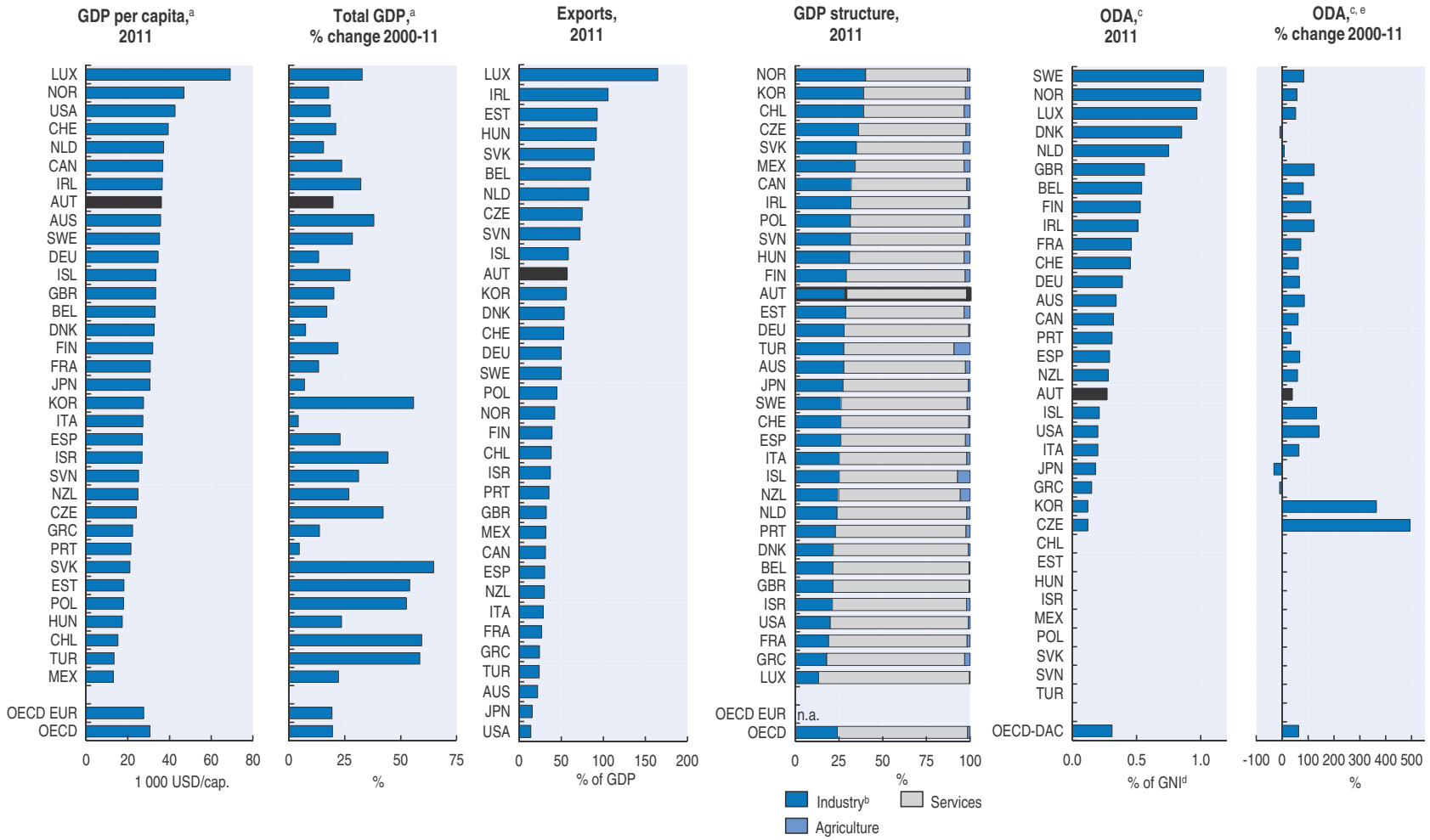
ANNEX I

Selected data

I.A. Selected economic data* 162
I.B. Selected social data 165
I.C. Selected environmental data 166

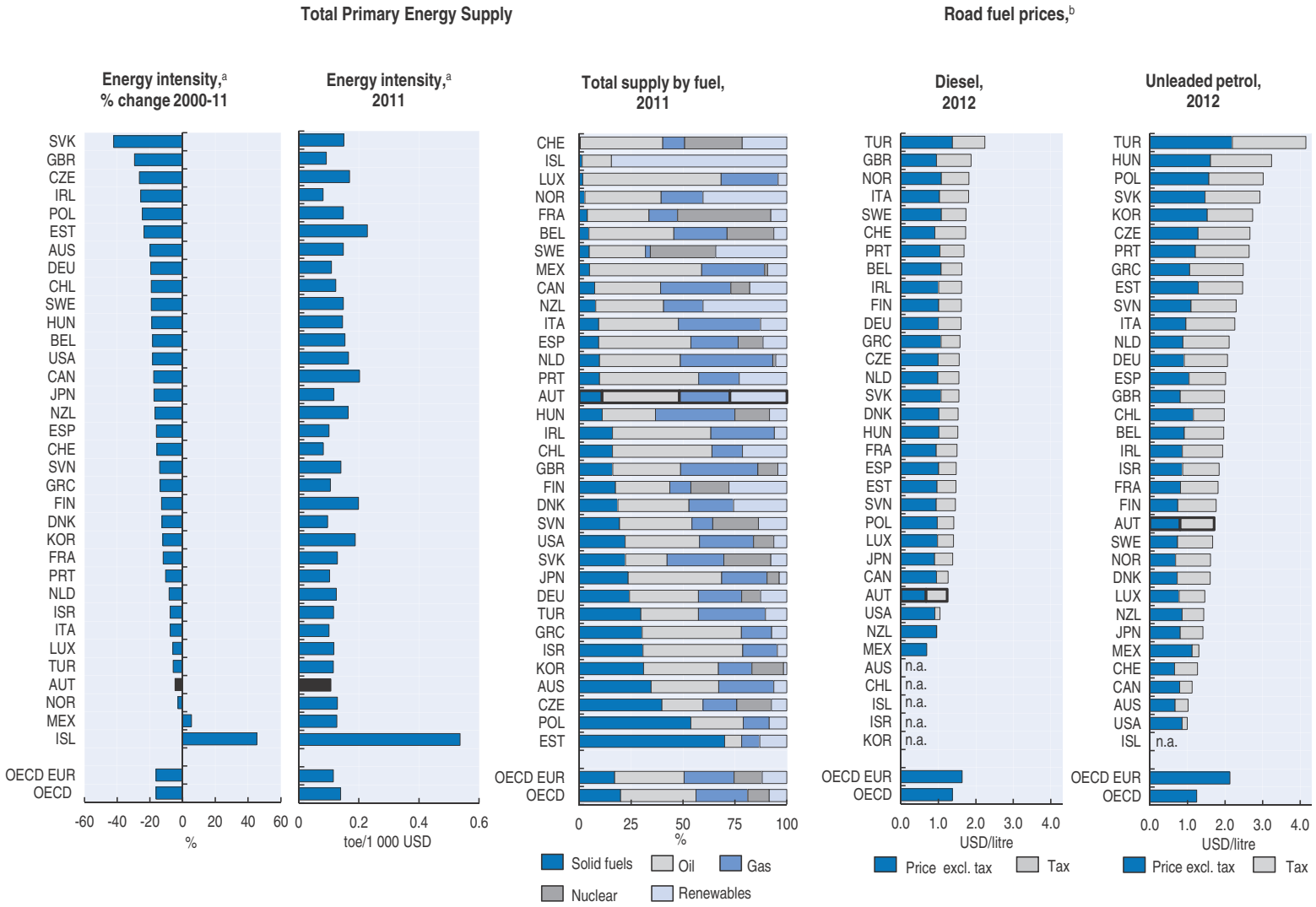
* The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

Annex I.A. **Selected Economic Data* - Economic context**



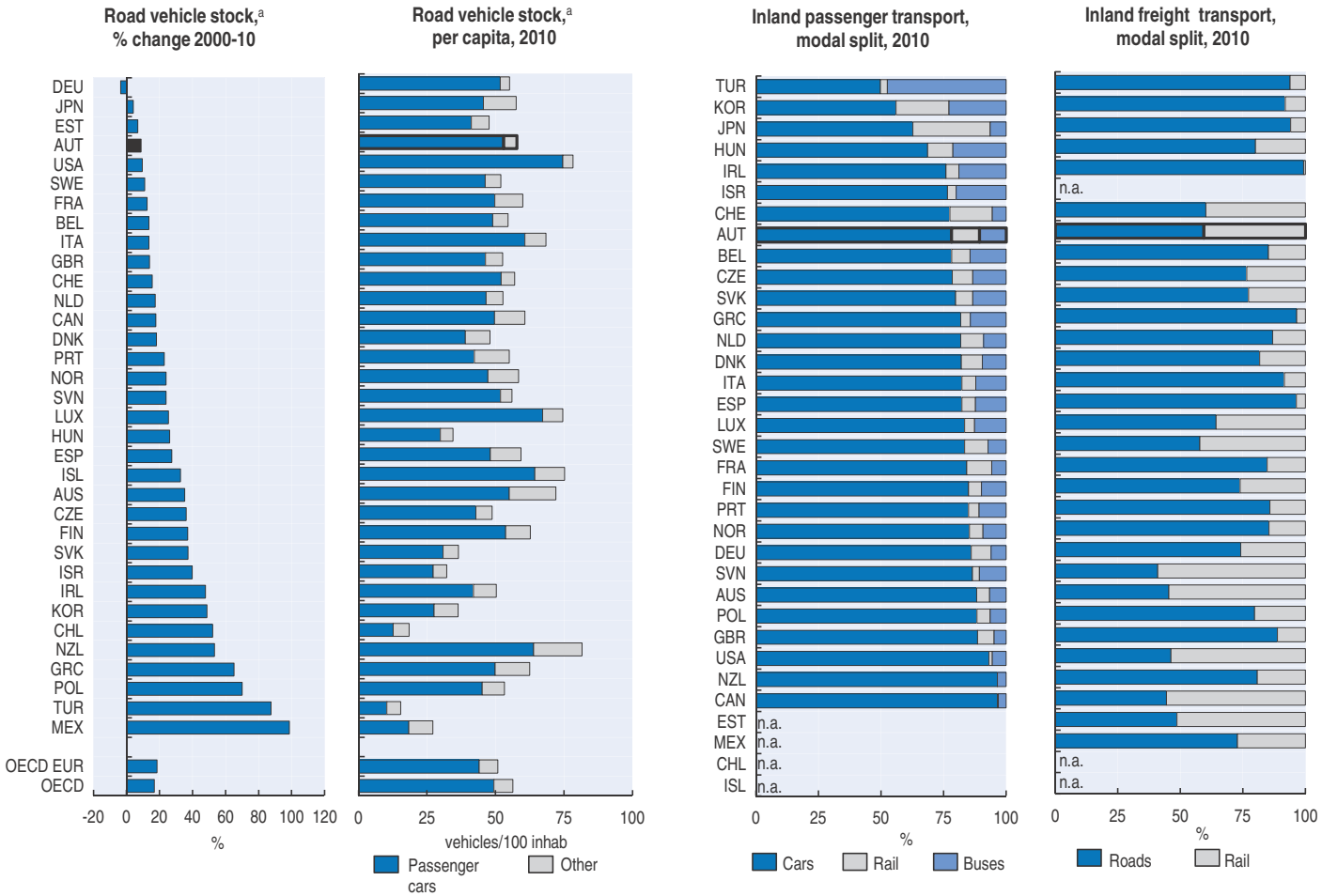
*) Data refer to the indicated year or to the latest available year. They may include provisional figures and estimates. Partial totals are indicated by dotted borders.
a) GDP at 2005 prices and purchasing power parities.
b) Includes mining and quarrying, manufacturing, gas, electricity and water, and construction.
c) Total net disbursement of official development assistance by member countries of the OECD Development Assistance Committee.
d) Gross national income.
e) Based on data expressed at constant 2010 USD; (CZE, ISL and KOR became DAC members after 2000).
Source: OECD Environmental Data.

Annex I.A. **Selected Economic Data* - Energy**



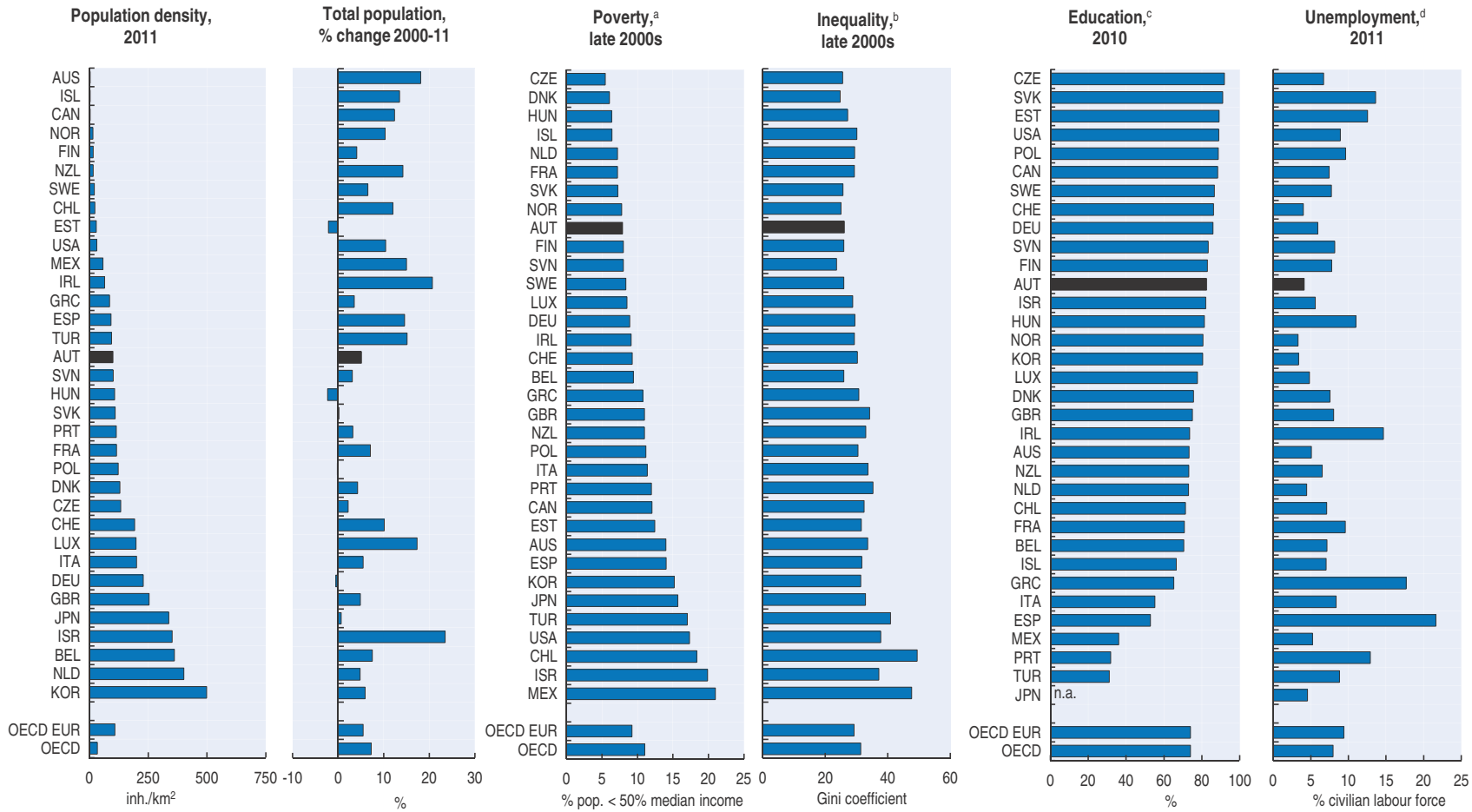
*) Data refer to the indicated year or to the latest available year. They may include provisional figures and estimates. Partial totals are indicated by dotted borders.
a) Total primary energy supply per unit of GDP expressed at 2005 prices and purchasing power parities.
b) Diesel fuel: automotive diesel for commercial use, current USD; unleaded petrol: unleaded premium (RON 95), except NZL (RON 96) and JPN (regular unleaded), USD at current prices and purchasing power parities.
Source: OECD Environmental Data.

Annex I.A. **Selected Economic Data* - Transport**



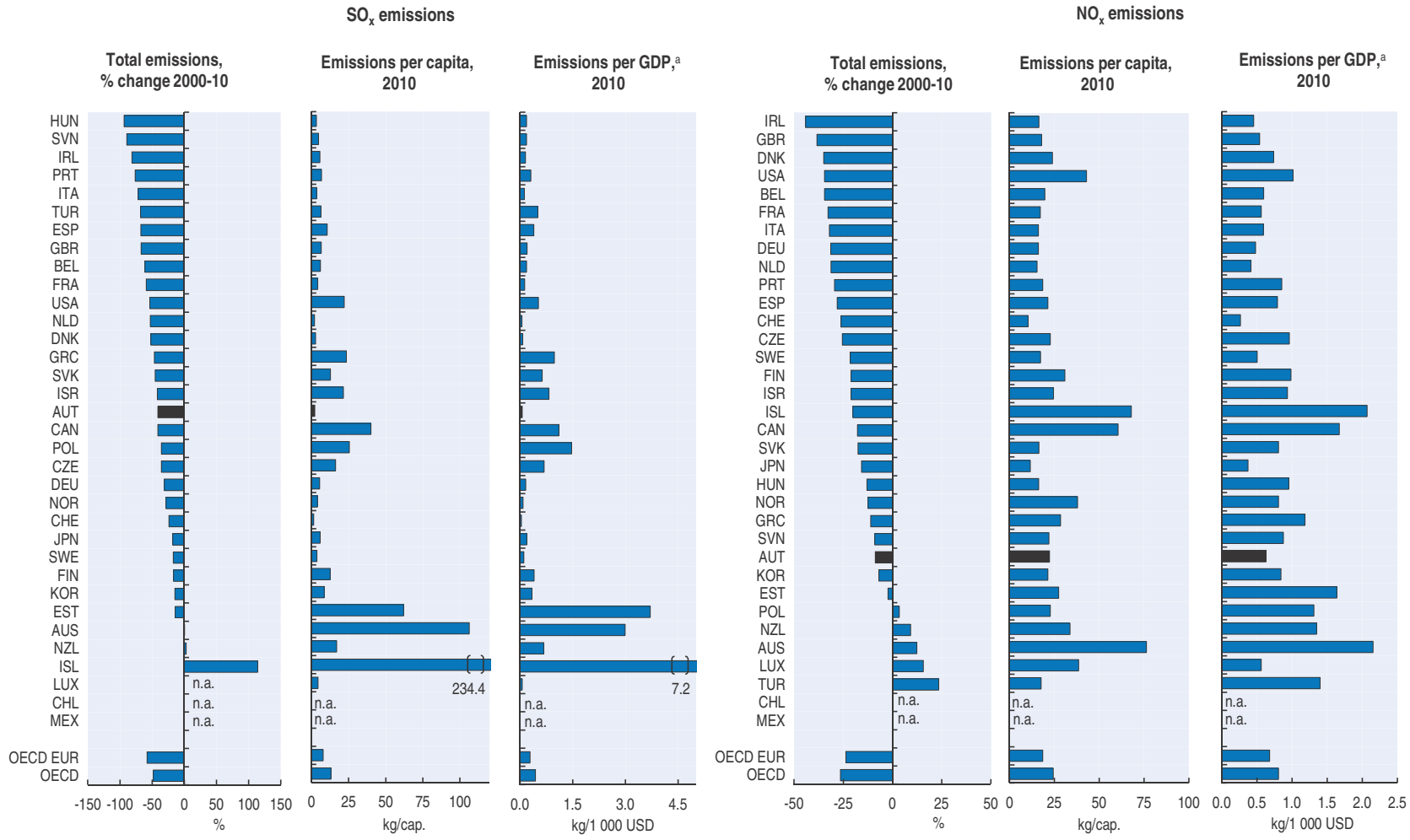
*) Data refer to the indicated year or to the latest available year. They may include provisional figures and estimates. Partial totals are indicated by dotted borders.
a) Motor vehicles with four or more wheels.
AUT: data on transport by mode refer to national vehicles only.
Source: OECD Environmental Data.

Annex I.B. **Selected Social Data* - Social context**



*) Data refer to the indicated year or to the latest available year. They may include provisional figures and estimates. Partial totals are indicated by dotted borders.
a) Share of population with an income under 50% of the median income. OECD: average of rates.
b) Ranging from 0 (equal) to 100 (inequal) income distribution; figures relate to total disposable income (incl. all incomes, taxes and benefits) for the entire population. OECD: average of rates.
c) Share of population aged 25-64 years with at least upper secondary education. OECD: average of rates.
d) Harmonised unemployment rates.
Source: OECD Environmental Data; *OECD.Stat Data Warehouse* (OECD Social Expenditure Statistics; OECD Education Statistics; OECD Main Economic Indicators).

Annex I.C. **Selected Environmental Data* - Air**



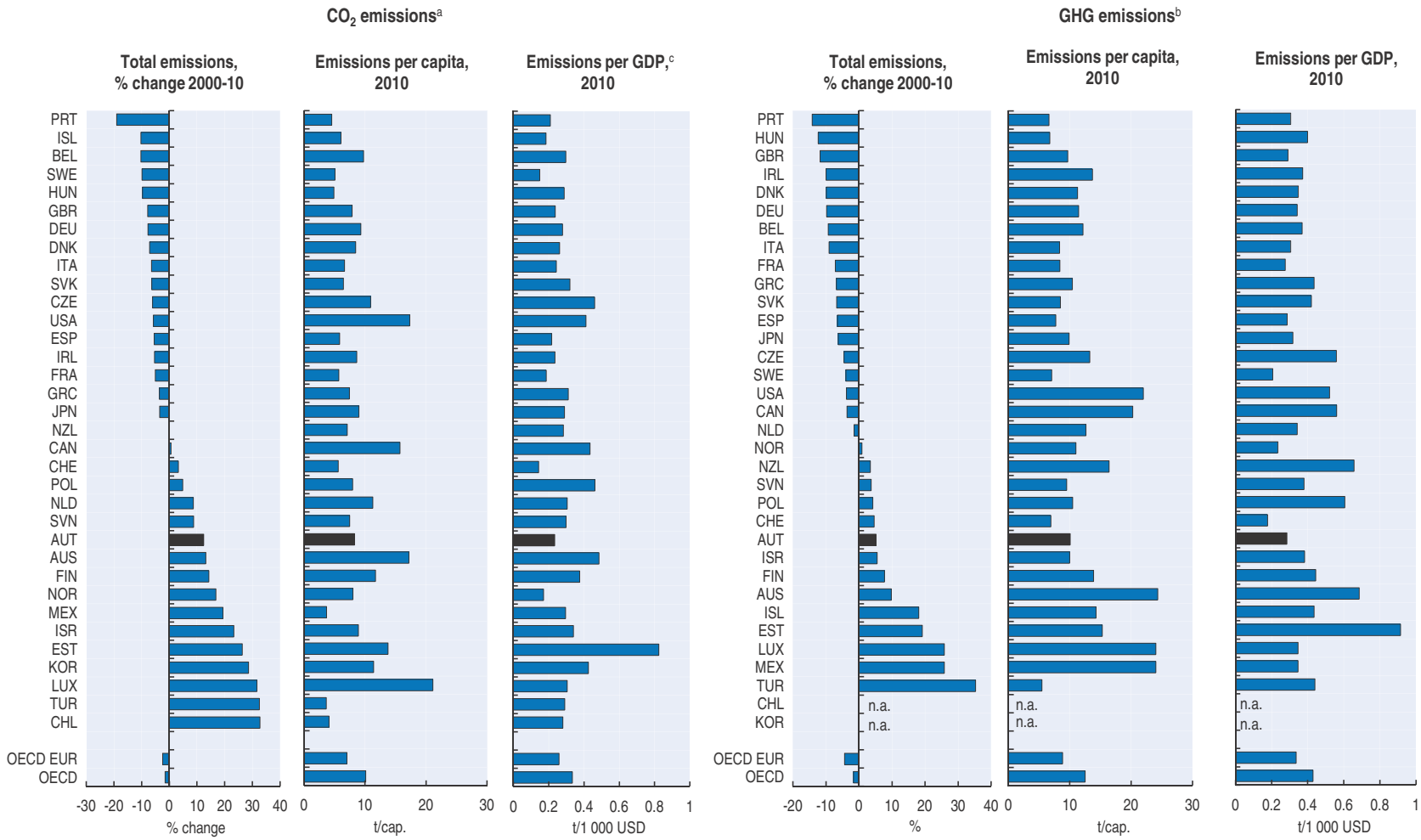
*) Data refer to the indicated year or to the latest available year. They may include provisional figures and estimates. Varying definitions can limit comparability across countries. Partial totals are indicated by dotted borders.

a) GDP at 2005 prices and purchasing power parities.

ISL: SO_x emissions include emissions from geothermal energy (182 kg per capita in 2010). KOR: Data refer to 2006. LUX: NO_x emissions exclude "fuel tourism emissions" and refer to 2009.

Source: OECD Environmental Data.

Annex I.C. **Selected Environmental Data* - Climate**



*) Data refer to the indicated year or to the latest available year. They may include provisional figures and estimates. Varying definitions can limit comparability across countries. Partial totals are indicated by dotted borders.

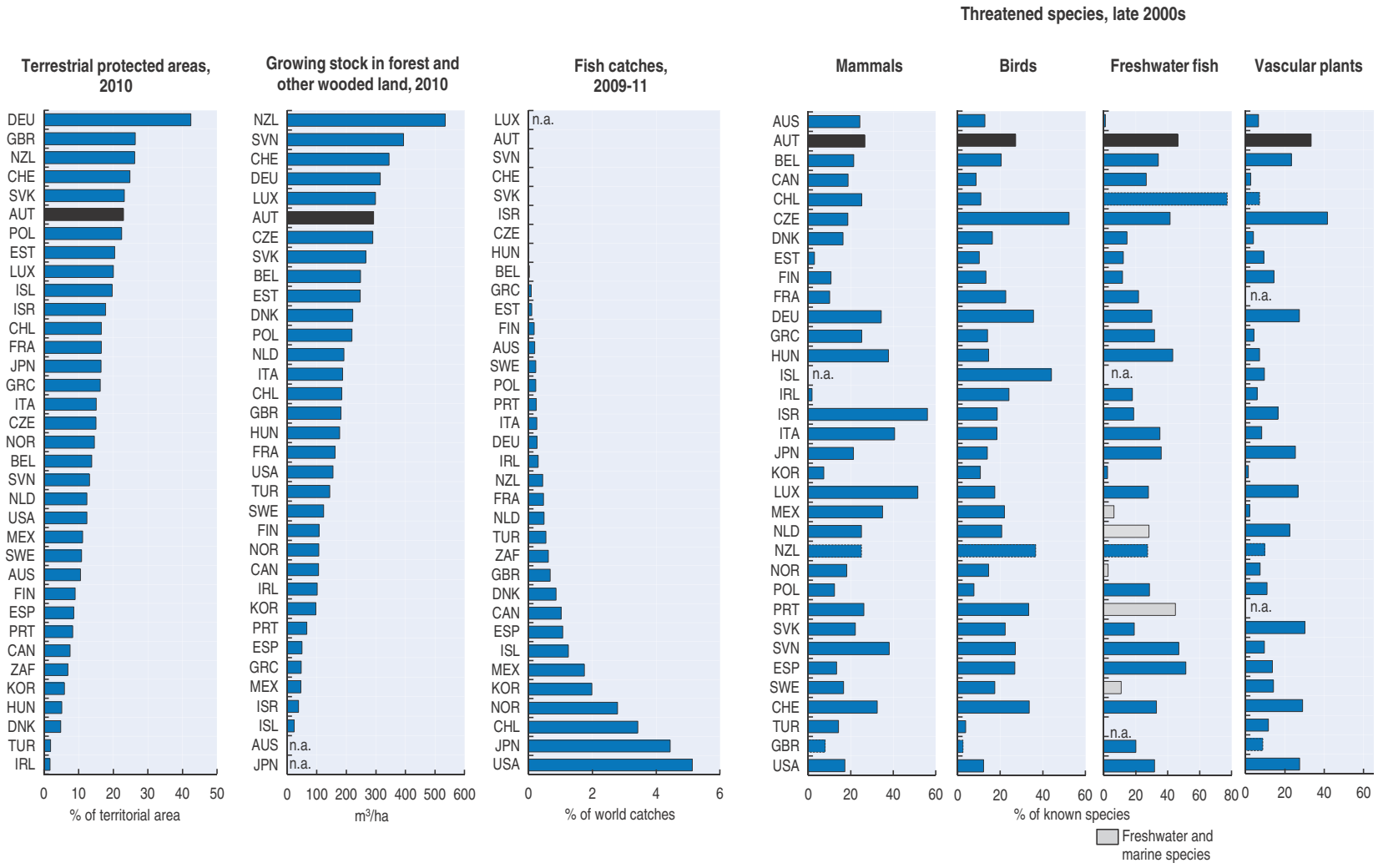
a) Emissions from energy use only; excluding international marine and aviation bunkers; sectoral approach.

b) Exluding emissions/removals of the land use, land-use change and forestry sector. ISR: 2000 data exclude F-gases.

c) GDP at 2005 prices and purchasing power parities.

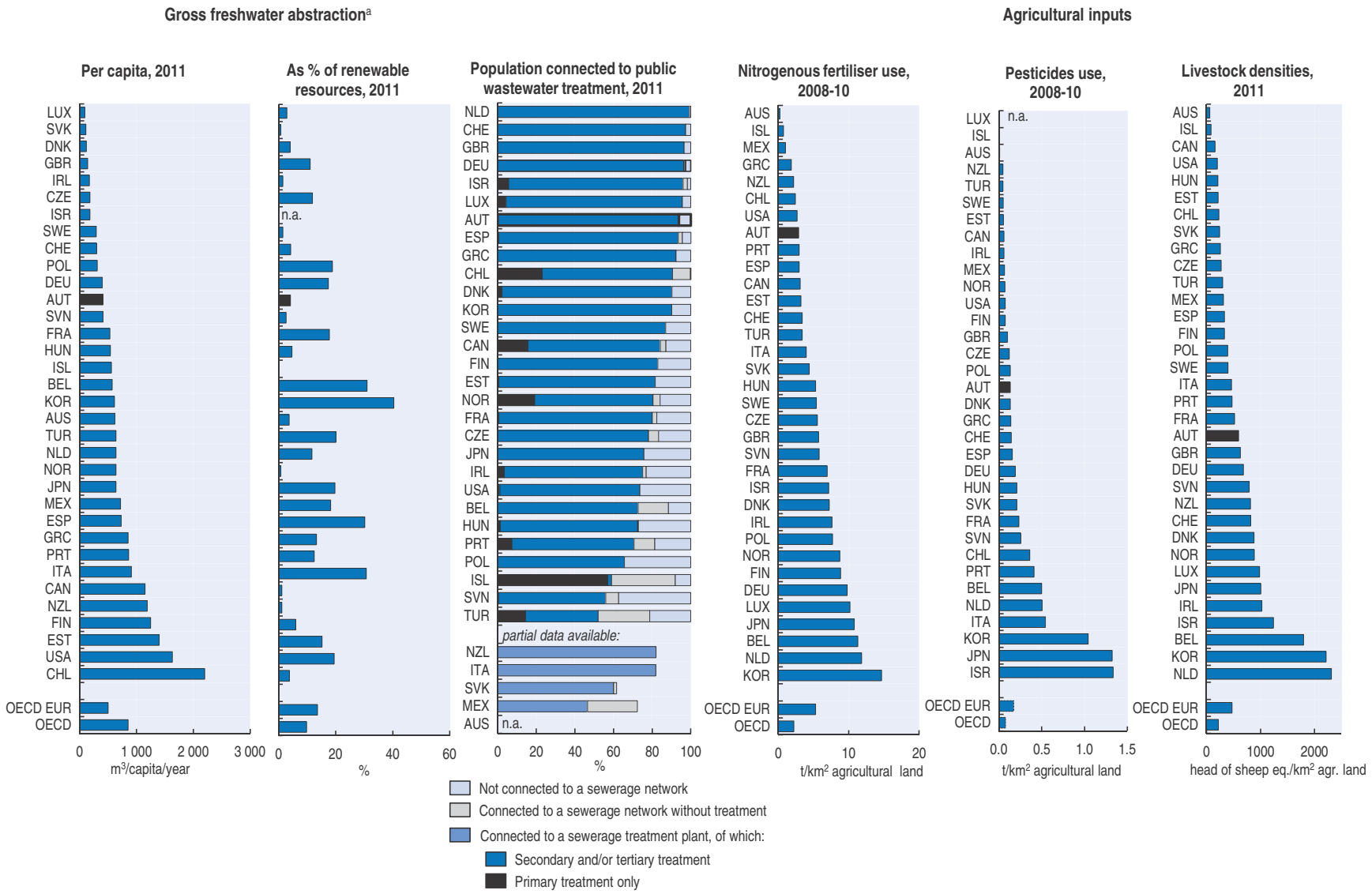
Source: OECD Environmental Data.

Annex I.C. **Selected Environmental Data* - Biodiversity conservation and sustainable use**



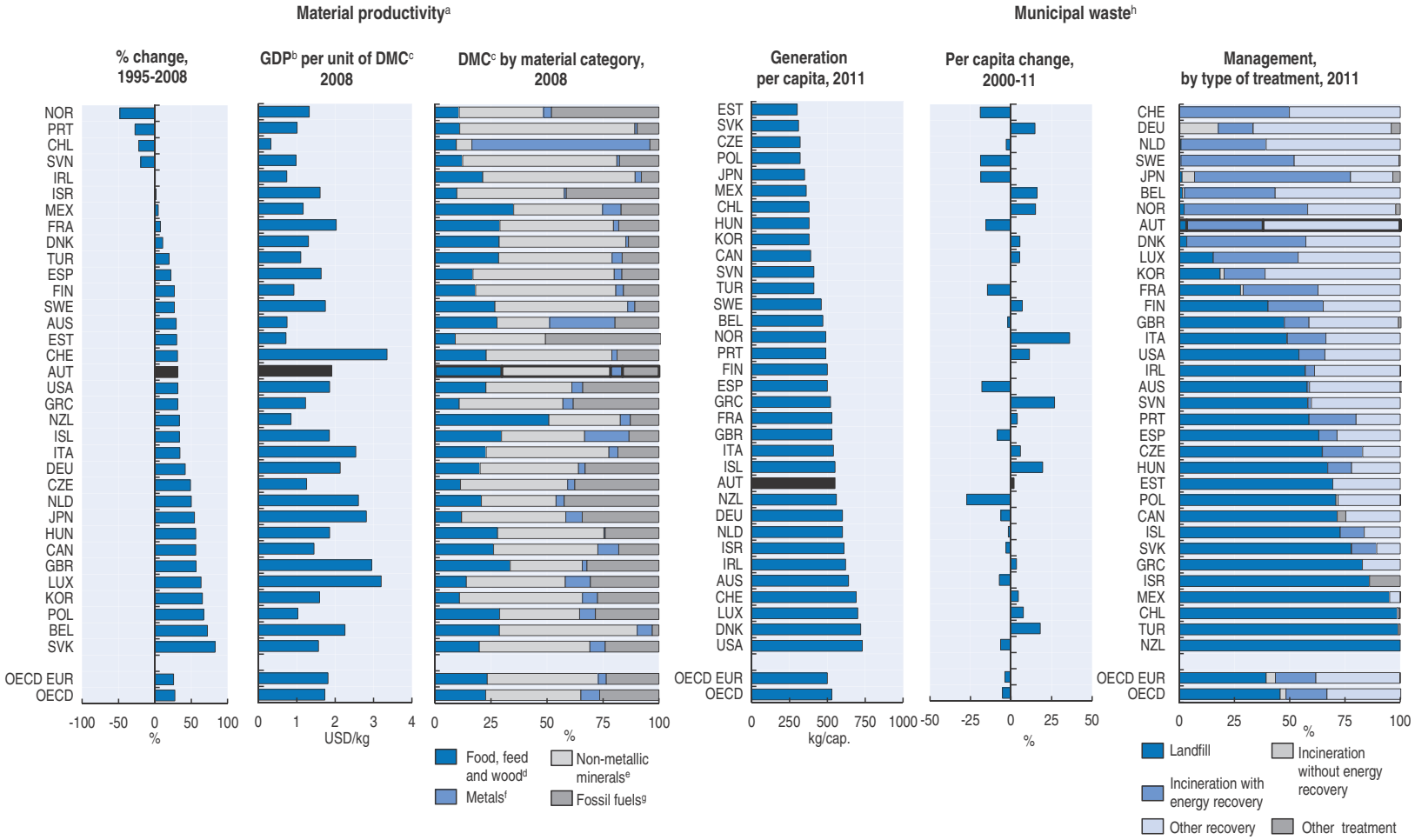
*) Data refer to the indicated year or to the latest available year. They may include provisional figures and estimates. Varying definitions can limit comparability across countries.
a) Includes different level of protection ranging from IUCN categories I to VI. National classifications may differ.
Threated species: data referring to indigenous species are indicated by dotted borders; NOR: threatened fish species: marine species only.
Source: OECD Environmental Data.

Annex I.C. **Selected Environmental Data* - Water and land**



*) Data refer to the indicated year or to the latest available year. They may include provisional figures and estimates. Varying definitions can limit comparability across countries.
a) For some countries, data refer to water permits and not to actual abstractions.
CHL: data for public wastewater treatment refer to population living in urban areas. GBR: Water abstraction and public wastewater treatment: England and Wales only; pesticides use: Great Britain only
Source: OECD Environmental Data.

Annex I.C. **Selected Environmental Data* - Material productivity and waste**



*) Data refer to the indicated year or to the latest available year. They may include provisional figures and estimates. Varying definitions can limit comparability across countries. Partial totals are indicated by dotted borders.
a) Amount of GDP generated per unit of materials used, ratio of GDP to domestic material consumption (DMC).
b) GDP at 2005 prices and purchasing power parities.
c) DMC equals the sum of domestic (raw material) extraction used by an economy and its physical trade balance (imports minus exports of raw materials and manufactured products).
d) Domestic production from agriculture, forestry and fisheries, plus trade of raw and processed products from these sectors.
e) Domestic extraction and trade of minerals used in industry and construction, plus trade of derived processed products.
f) Domestic extraction of metal ores, plus trade of metal ores, metal concentrates, refined metals, products mainly made of metals, and scrap.
g) Coal, crude oil, natural gas, peat and traded derived products.
h) Waste collected by or for municipalities and includes household, bulky and commercial waste, and similar waste handled at the same facilities. CAN: household waste only and total incineration; NZL: landfilled waste only.
Source: OECD Environmental Data.

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ANNEX II

Abbreviations

ABA	Austrian Business Agency
ACA	Austrian Court of Audit
AIT	Austrian Institute of Technology
BMEIA	Federal Ministry for European and International Affairs
BMASK	Federal Ministry for Labour, Social Affairs and Consumer Protection
BMLFUW	Federal Ministry for Agriculture, Forestry, Environment and Water Management
BMVIT	Federal Ministry for Transport, Innovation and Technology
BMWFJ	Federal Ministry of Economy, Family and Youth
BPR	Biocidal Products Regulation
CCS	Carbon capture and storage
CLEEN	Chemical Legislation European Enforcement Network
CLP	Classification, labelling and packaging
CRED	Centre for Research on the Epidemiology of Disasters
CO_2	Carbon dioxide
DAC	Development Assistance Committee, OECD
DALYs	Disability-adjusted life years
DMC	Domestic material consumption
EC	European Commission
ECHA	European Chemicals Agency
EEA	European Environment Agency
EGS	Environmental goods and services
EIA	Environmental impact assessment
EMAS	EU Eco-Management and Audit Scheme
EM-DAT	The International Disaster Database
ESDN	European Sustainable Development Network
ETS	Emissions trading system
EU	European Union
EUR	Euro
FIT	Feed-in tariff
FAO	Food and Agriculture Organization
FCIO	Austrian Chemicals Industry Association
GDP	Gross domestic product
GHG	Greenhouse gas
GNI	Gross national income
ICCA	International Council of Chemical Associations

IEA	International Energy Agency
IMC	ClimateInterministerial Committee for the Co-ordination of Measures on the Protection of the Global Climate
IMPEL	European Union Network for the Implementation and Enforcement of Environmental Law
IPCC	Intergovernmental Panel on Climate Change
IPPC	Integrated Pollution Prevention and Control
IUCN	International Union for Nature Conservation
KPC	Kommunalkredit Public Consulting
LA21	Local Agenda 21
LAS	Linear alkyl sodium sulphonates
LPG	Liquefied petroleum gas
MONARPOP	Monitoring Network in the Alpine Region for Persistent Organic Pollutants
NAMEA	National Accounting Matrix with Environmental Accounts
NAS	National Adaptation Strategy
NEC	EU National Emission Ceilings
NGO	Non-governmental organisation
NMVOC	Non-methane volatile organic compound
NO_x	Nitrogene oxides
N_2O	Nitrous oxide
NSTRAT	National Strategy for Sustainable Development
ODA	Official Development Assistance
ÖPUL	Agri-environmental programme
ÖSTRAT	Austrian Strategy for Sustainable Development
PAH	Polycyclic aromatic hydrocarbons
PBDEs	Polybrominated diphenyl ethers
PV	Solar photovoltaics
PCBs	Polychlorinated biphenyls
PCDD	Polychlorinated dibenzo-p-dioxins
PCT	Patent Co-operation Treaty
PISA	OECD Programme for International Student Assessment
PIC	Prior Informed Consent
PLANALP	Platform on Natural Hazards of the Alpine Convention
PM	Particulate matters
POPs	Persistent organic pollutants
PPP	Purchasing power parity
PRTR	Pollutant release and transfer register
QSP	Quick Start Programme
RCN	Risk Communication Network
R&D	Research and development
REACH	EU Regulation on Registration, Evaluation, Authorisation and Restriction of Chemicals
RIA	Regulatory impact assessment
SAICM	Strategic Approach to International Chemicals Management
SEA	Strategic environmental assessment
SKKM	State Crisis and Catastrophe Management
SME_S	Small and medium-sized enterprises

SOx	Sulphur Oxide
SVHC	Substances of very high concern
TPES	Total primary energy supply
UFI	Umweltförderung im Inland
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNIDO	United Nations Industrial Development Organization
USD	United States Dollar
VAT	Value added tax
VOC	Volatile organic compound
WFD	EU Water Framework Directive
WHO	World Health Organization
WIFO	Austrian Institute of Economic Research
WKÖ	Austrian Economic Chamber

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Chapter 1. Key environmental trends

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